Chino Landscape Restoration Project

Vegetation Specialist Report

Submitted by: _____

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Introduction

The purpose of this report is to evaluate the potential environmental consequences of this project on vegetation and the potential impacts to Forest Service, Southwestern Region (Region 3) sensitive and invasive plant species associated with the implementation of the Chino Landscape Restoration Project. The report outlines current regulatory direction, which guides the development of management activities. It discusses the methods of analysis, summarizes the existing condition, and discloses the direct, indirect, and cumulative effects of the proposed action and alternative A, the proposed action minus roads, within the project area.

Laws, Regulations, and Policy

Invasive Species, Executive Order 13112 of February 3, 1999; amended December, 2016

This Executive order is one of the founding directives of the noxious or invasive plant control on National Forest System lands. Executive Order 13112, as amended, calls upon executive departments to put into place proactive and appropriate management to prevent the introduction, establishment and spread of invasive species. Agencies are encouraged to support efforts of eradication and control of invasive species in collaboration with other Federal, state, local, tribal and private entities. On December 5, 2016, this Executive order was amended to direct action to continue coordinated Federal prevention and control efforts related to invasive species and to consider additional emerging stressors, such as climate change, in managing invasive species.

Forest Service Manual/Handbook

Forest Service Manual (FSM), FSM 2620, 2630, 2670, 2672. These manual directives address the management of Forest Service Southwestern Region sensitive species.

- Assist states in achieving their goals for conservation of endemic species.
- Review programs and activities as part of the National Environmental Policy Act of 1969 process through a biological evaluation, to determine their potential effect on sensitive species.
- Avoid or minimize impacts to species whose viability has been identified as a concern.
- Analyze, if impacts cannot be avoided, the significance of potential adverse effects on the population or its habitat within the area of concern and on the species as a whole.
- Establish management objectives in cooperation with the states when projects on National Forest System lands may have a significant effect on sensitive species population numbers or distributions. Establish objectives for Federal candidate species, in cooperation with the USDI Fish and Wildlife Service or National Oceanic and Atmospheric Administration-Fisheries and the states.

Land and Resource Management Plan

The 2015 *Land and Resource Management Plan for the Prescott National Forest* (Forest Service, 2015) (hereinafter referred to as the Forest Plan) contains desired conditions that describe how the resources on the Prescott NF should look and function and provides standards and guidelines for vegetation, noxious weeds and sensitive plant species relevant to the project area.

Desired conditions relevant to the vegetation on the Chino Landscape Restoration project include Vegetation Desired Conditions DC-Veg-1, DC-Veg-2, DC-Veg-4, DC-Veg-5, DC-Veg-6, DC-Veg-7, DC-Veg-9, DC-Veg-11, DC-Veg-13, DC-Veg-14, DC-Veg-16; DC-Veg-17, DC-Veg-18; DC-Veg-20, DC-Veg-21; and Wildlife Desired Conditions DC-Wildlfe-1.

Purpose and Need

The Forest Service is proposing a series of actions to restore and maintain soil and watershed function, vegetation conditions, riparian and groundwater dependent systems, and natural fire regime. The goal is to move the landscape toward desired conditions described in the 2015 Land and Resource Management Plan for the Prescott National Forest (hereinafter referred to as the Forest Plan) and improve wildlife habitat for pronghorn antelope, migratory birds, native fish, and federally listed or regionally sensitive species.

Key to the implementation of this project is the Central Arizona Grasslands Conservation Strategy (CAGCS). As noted in the charter of the CAGCS (Arizona Game and Fish Department, 2014), the Prescott NF is operating under the regionally-directed "Central Priority". This direction emphasizes the restoration of fire-adapted ecosystems, of which grasslands are a major component.

Summary of Alternatives

The proposed action and following alternative were considered:

Proposed Action

Treatments will include vegetation thinning, prescribed burning, and fuels reduction. Other actions include erosion control and impact mitigation for forest system roads, unauthorized routes, and unmanaged recreation use. The expectation is an improvement in ecological function and an increased diversity in the structure and composition of the vegetation. Benefits would include increased soil moisture, reduced soil movement, and improved water quality. The treatments are also expected to increase the resilience of the ecosystem to respond to expected changes imposed by future climate trends.

The project will include changes to the road and trail system to improve watershed and wildlife habitat conditions. These changes will include road closures (in whole and in part), road access restrictions (seasonally and year-round), and road decommissioning (in whole and in part).

Alternative A

Alternative A includes the vegetation treatments, erosion control measures, and recreation use and RATM route mitigations described for the proposed action, but does not include any road decommissions, closures, or restrictions.

Methodology and Analysis Process

ArcMap 10.2 was used in this analysis to quantify soils, riparian, PNVT and other data by the project area, as well as to produce maps. Treatment effects, by PNVT, were estimated based on general PNVT characteristics and professional judgment and experience. Because of the numerous factors that can influence fire effects on soils and vegetation, the assumptions of fire effects are estimates only. Various scientific literature sources were also used to support estimated fire effects.

Methods for Vegetation Analysis

The following data sources were used to support this analysis.

Data on the affected environment of the vegetative types comes from the Terrestrial Ecosystem Survey (TES) of the Prescott National Forest (USDA 2000), the Ecological Response Units of the Southwester Unite States (ERU), the Ecological Classification of the Prescott National Forest (EC), and from field notes, inspections and site visit documentation. Also utilized are technical publications. Environmental consequences are derived from technical publications, research documents and monitoring including data collection, field notes, inspections and from other records found in Chino Valley Ranger District files.

The existing condition of the Potential Natural Vegetation Types (PNVTs) used the R3 mid-scale vegetation assessments to compare to Desired Conditions for vegetation structure and fire disturbance. The PNVTs are based on the Terrestrial Ecosystem Survey (TES) (Terrestrial Ecosystem Survey 2000)

Since the completion of the Prescott NF TES the process name has been changed to the Terrestrial Ecosystem Unit Inventory (TEUI); this avoids confusion with Threatened and Endangered Species (TES). The TEUI is described in the Soils section. TEUI map unit descriptions include lists of plant species from 1/10 acre plots and from observations recorded while on the polygon where the plot was read. Representative TEUI map units were used to describe the affected environment, current condition, and effects for each vegetative type as it relates to the Proposed Action.

The Ecological Classification of the Prescott National Forest describes the variety of vegetation community types found in each TEUI map unit. EI data was collected using the same methodology as the TEUI plots. TEUI and EI plot data was modeled to display the range of variability in TEUI map units. Community Types (CTs) were described when multiple plots had comparable cover and species composition. The objective of this classification is to categorize existing vegetation data into a framework of recognizable plant communities based on the potential vegetation community and soil characteristics described in the TEUI.

Data on the existing condition of the vegetative types also comes from the Prescott National Forest mid-scale data. The mid-scale data for the Prescott was a remote sensing project that quantified woody canopy cover and tree size. Percent cover and tree size are used to define what seral state a site currently is in. The following definitions are for the remainder of the document grass/forb (<10% woody cover), open canopy (10-29% woody cover), closed canopy (≥30% woody cover).

The recent Goodwin Fire, which started on June 24, 2017, burned 25,648 acres of National Forest Systems lands within the project area. Most of the vegetation impacted (interior chaparral) burned within the natural range of variability (i.e., vegetation adapted to high-severity fire). The remaining vegetation types (22 percent of fire area) experienced mostly low- to mixed-severity fire, with only 1 percent of all acres in the burn area, excluding interior chaparral vegetation, experiencing high-severity fire. Fire did burn through existing infestations of invasive plant species within the project area. Some mapped areas (20 acres) of Dalmatian toadflax experienced mixed- to high-severity fire (most acres within interior chaparral) and as a result these affected populations/sites may experience an increase in abundance of Dalmatian toadflax. Very few acres (2 acres) of scotch thistle were affected and most experienced low-severity fire (mostly in riparian areas); hence, there is a lower likelihood that existing populations will experience an increase in abundance. There is a low probability that current conditions for tamarisk are substantially altered from the recent Goodwin Fire, because less one-third of an acre of tamarisk was affected and less than 33 percent of that area experienced high-severity fire. About 1 acre of tree of heaven experienced mixed- to high-severity fire; therefore, these areas could experience an increase in abundance of tree of heaven. While the effects of the recent Goodwin Fire may increase the abundance and extent of these invasive plants, it should be noted that most existing populations in the project area were unaffected and those that were affected experienced mostly low- to mixed-severity fire, thereby reducing the opportunities for invasive plants to establish and spread (i.e., less bare ground and loss of native vegetation). For these reasons, it is unlikely that the Goodwin Fire has significantly altered existing/current conditions for invasive plant species in the project area.

Methods for Invasive Plant Species

Effects of the proposed actions on influencing invasive plant species establishment and spread was assessed for each alternative. Existing mapped invasive plant occurrences were obtained from the Natural Resource Manager within the Forest Service Threatened, Endangered, and Sensitive Plant–Invasive Species (TESP-IS) database. These polygons represent mapped estimates of invasive plant infestations, but do not necessarily represent individual populations or population size estimates. For the purposes of the analysis, different polygons of the same invasive plant species are assumed to have a similar density or abundance of plants. Invasive plant layers were intersected with the proposed activities in GIS to assess what proportion of infested acres were located in each activity for each alternative to describe anticipated effects.

Analyzing Effects of Invasive Plant Species

Typically, invasive plant species have the ability to spread rapidly and reproduce in high numbers, which enables them to effectively crowd out native plant populations. Some can pose serious threats to the composition, structure, and function of native plant communities and ecosystems. Negative impacts from invasive plant species to ecosystems generally occur from ground disturbance activities that create openings for existing or new populations to expand into and through the transport of invasive plant species from machinery. Large, severe fires can also create large openings and invasive plant species may have competitive advantages over native plants to fire (i.e., superior post-fire recovery) that allows them to spread into recently disturbed sites. Effects from invasive plant species may be minimal where the intensity of ground disturbance is low, there are no existing invasive plant infestations in the area, or resource protection measures reduce the likelihood of increasing invasive plant infestations or expanding existing ones (e.g., by treatment or removal).

A categorized list of invasive nonnative plants for the State of Arizona was developed by the Arizona Wildlands Invasive Plant Working Group. The group is comprised of representatives from Federal, state, and local organizations: U.S. Department of Agriculture, U.S. Geological Survey, The Nature Conservancy, the National Park Service, Northern Arizona University, University of Arizona, and others (Warner et al. 2003). Species ranking (high, medium, low) are evaluated based on ecological impacts (fire occurrence, erosion, hydrological regimes, nutrient cycling), invasiveness (role of human and natural disturbance in establishment), ecological distribution (the extent of invasion for a given ecological type) and current ecological amplitude (the number of ecological types invaded). Caution should be taken when interpreting invasive species risk to ecosystems. Arizona Wildlands Invasive Plant Working Group rankings describe invasive species overall risk to ecosystems across species range; however, effects on ecosystems can vary between sites (or example, high-elevation versus low-elevation sites). Invasive species, distribution (mapped and inferred) and risk to ecosystems are described for each ecological response unit on the Prescott National Forest.

Data Sources for Invasive Plant Species

The following data sources were used to support this analysis:

- The TESP-IS database was used to derive GIS polygon layers used in the analysis for each activity within each alternative. Only mapped invasive plant occurrences within the project area were analyzed.
- The Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2004) was referenced to obtain information on species status and current conditions on the Prescott National Forest.
- Available Arizona Wildlands Invasive Plant species abstracts.

Methods for Sensitive Plant Species

Effects to sensitive plant species were assessed by analyzing the number of populations affected by each proposed activity for each alternative within the project area. This was done by

intersecting the occurrence records (point features) with each proposed activity (polygon features) in GIS. For the purposes of this analysis, all occurrence points were considered equal populations with an equal number of individuals and similar accuracies. Polygons for these plants are unavailable and counting individuals plants has not been done in most cases. Coarse population estimates of size and number are available on some and not available on most. Delineating polygons around populations and counting individual plants has proven to be impractical and this information is unavailable. In reality, some of these point populations may have a few individuals and others may have hundreds.

The range and distribution of a number of Region 3 sensitive plant species on the Prescott National Forest does not coincide with the project area and these were eliminated from further analysis. The species eliminated from further analysis include the following:

- Phillip's agave (*Agave phillipsiana*)
- Cochise sedge (*Carex ultra*)
- Metcalfe's tick-trefoil (*Desmodium metcalfei*)
- Flagstaff pennyroyal (*Hedeoma diffusum*)
- Greene milkweed (*Asclepias uncialis* ssp. *uncialis*)
- Heathleaf wild buckwheat (*Eriogonum ericifolium* var. *ericifolium*)
- Mt. Dellenbaugh sandwort (*Arenaria aberrans*);
- Rock fleabane (*Erigeron saxatilis*); and,
- Tonto Basin agave (*Agave delamateri*).

Analyzing Effects to Sensitive Species Viability

Effects to species viability was assessed for each alternative for each sensitive plant species analyzed. This analysis describes the effects of the actions on sensitive plant species and the effects to the habitat and its ability to support the associated sensitive plant species.

A substantial loss of viability is expected to occur when the intensity of effects is anticipated to result in a significant loss of individuals or populations. In addition to direct damage, degraded habitat conditions (such as severe soil erosion or altered fire regimes) can also influence loss of suitable habitat and species viability. Effects may have minimal impacts in situations where an action has little to no effect (e.g., plants generally located in areas inaccessible to ground-disturbance activities) or the severity of the proposed action is low for a particular species and associated habitat. The effects to the species viability as a whole is also considered in this analysis.

For example, a reduction in the number of individuals for one population may not be critical (i.e., low viability concern) if the intensity of effects are low and there is a substantial number of stable populations outside the project area. Conversely a loss of one population may have significant impacts to the species viability if the intensity of effects are high and the species as a whole has very few populations and small numbers of individuals. Table 1 displays the qualitative analysis approach used in assessing viability concern for sensitive plant species. In this table, green cells

represent when viability concerns are low, yellow and orange represent when viability concerns are moderate, and red cells represent when viability concerns are high. Intensity of effects are high when an action has a high probability of eliminating affected individuals or the habitat. Intensity of effects are low when the action minimally affects populations or the habitat (e.g., short-term effects, anticipated to recover).

Table 1. Analysis approach for assessing species viability concern

		Proportion of Populations Affected (forest-wide)		
		Low	Moderate	High
Intensity of Action/Effects	Low	Low VC	Low VC	Low/Moderate VC
	Moderate	Low/Moderate VC	Moderate VC	High VC
	High	Low/Moderate VC	High VC	High VC

Data Sources for Sensitive Species

The following data sources were used to support this analysis.

- The Southwest Environmental Information Network was referenced to verify species occurrence data to supplement existing species records and survey data, to verify locality descriptions, and other available relevant information (associated plant community, population estimates, etc.).
- The Arizona Heritage Data Management System element abstracts were referenced to obtain information on conservation status, population trends and threats for sensitive plant species within the project area.
- NatureServe database and species abstracts were referenced to obtain information on conservation status, population trends and threats for sensitive plant species within the project area.
- Viability analysis report (Baker 2014) for plant species of concern to support the analysis for Forest Plan revision on the Prescott National Forest. Both the report and associated GIS data (occurrence records for the forest) was used in this analysis. This information was heavily relied on as it represents the most current analysis of current conditions for sensitive plant species on the Prescott National Forest.

Assumptions

In the analysis of the project alternatives, the following assumptions have been made:

- Existing protocols for resource protection will continue unless modified by the selected alternative.
- That implementation of the selected alternative, if other than No Action, will be dynamic and can be adjusted as needed to achieve the desired effects consistent with the environmental consequences described in this analysis.
- The planning period for this analysis is 10 years or as long as the environmental consequences are applicable and consistent with desired conditions.

Affected Environment

PNVT Vegetation Types

Vegetation in the Forest Plan is organized by potential natural vegetation types (PNVT). PNVTs are units of land that share similar vegetation, climate, soils, and natural disturbances. The distribution and acres of PNVTs within the Chino Landscape project area is summarized in Table 2.

Table 2. List and amount of all the PNVTs that occur in the project area (approximate).

PNVT	Project Acres	Percent of Project Area
Piñon-Juniper Evergreen Shrub	246,950	58%
Juniper Grassland	82,450	19%
Great Basin Grassland	25,900	6%
Ponderosa Pine-Evergreen Oak	21,250	5%
Piñon-Juniper Woodland	17,300	4%
Interior Chaparral	9,900	3%
Ponderosa Pine-Gambel Oak	13,170	3%
Semi-Desert Grassland	2,400	1%
Riparian Gallery Forest	3,500	1%

Piñon-Juniper Evergreen Shrub

TEUI 043, 430, 432, 434, 440, 441, 444, 445, 446, 447, 452, 454, 455, 458, 459, 461, 462, 464, 465, 466, 473, 474, 477, 479, 480, 481, 482, 485, 486, 491, 499

This vegetative type is 58% of the Chino Landscape analysis area and occurs throughout the project area except for the Checkerboard. The densest stands are found west of Sycamore Canyon Wilderness, Hwy 89 and around the Walnut Creek and Hitt Wash areas.

The unit is represented by piñon and juniper trees on a variety of soils derived from granite, limestone, basalt, sandstone, and alluvium, between 4,400 and 6,400 feet in elevation on mostly moderate (15-40%) slopes. TEUI tree cover ranges from 12% (TEUI 432) to 27% (TEUI 462). Utah juniper (*Juniperus osteosperma*) is dominant between 4000 and 5000 feet in elevation and alligator juniper (*J. deppeana*) is the most common in the higher elevations. Piñon pines include Arizona (*Pinus fallax*) and twin needle (*P. edulis*). TEUI 485 has alligator juniper and piñon pine while TEUI 491 has alligator juniper associated with Arizona white oak (*Quercus arizonica*).

TEUI predicts shrub cover of between 23 (TEUI 430) and 34 (TEUI 485) percent averaging about 25%. Shrub live oak (*Quercus turbinella*) is the dominant shrub averaging 12% cover. Other shrubs that are locally abundant include desert ceanothus (*Ceanothus greggii*), catclaw mimosa

(*Mimosa acanthocarpa biuncifera*) and mountain mahogany (*Cercocarpus montanus*) with skunkbush (*Rhus trilobata*), Wright's silktassel (*Garrya wrightii*) and prickly pear (*Opuntia englemannii*) appearing in lesser amounts.

Predicted grass cover averages about 18% with actual cover averaging 21%. Species diversity on plots averaged about one half of predicted with sideoats grama (*Bouteloua curtipendula*) and curly mesquite (*Hilaria belangeri*) being most common with blue (*B. gracilis*) and hairy gramas (*B. hirsuta*) present on most units.

This PNVT is departed by 65% from desired conditions. Historically, trees occurred as individuals or in small groups as a consequence of mixed severity fire. Currently, closed tree canopy accounts for 51% of the unit and desired condition would be 0% closed tree canopy. Long-term fire suppression has resulted in in-filling of canopy gaps, increased density of tree groups, and reduced composition, density and vigor of the herbaceous understory plants.

Juniper Grassland

82,131 acres

TEUI 042, 402, 407, 413, 414, 423, 427, 439, 456, 463, 470, 471, 472, 490

Juniper grasslands are 19% of the Chino Landscape analysis area. Majority of this unit is found on the East Zone, east of Hwy 89. There are also two geographically separate areas on the West Zone, one on Tailholt Mesa and west of the Yolo Ranch. The densest sites occur on the West Zone, with the East Zone sites typically being more open.

The Juniper Grassland PNVT consists of a grass and forb dominated understory with scattered overstory trees. It generally occurs on flats, basins, gentle sloping foothills, and transitional valleys and is usually associated with deep and productive soils. The soils are derived from limestone, basalt, sandstone, and alluvium, between 3,850 and 6,840 feet in elevation on mostly slight to moderate (0-35%) slopes. Tree cover ranges from 5% (TEUI 042) to 35% (TEUI 490). Utah juniper (*Juniperus osteosperma*) is dominant between 4000 and 5000 feet in elevation and alligator juniper (*J. deppeana*) is the most common in the higher elevations (TEUI 490). Piñon pines are a minor component, but include Arizona (*Pinus monophylla*) and twin needle (*P. edulis*).

TEUI predicts variable shrub cover of between 4 (TEUI 490) and 36 (TEUI 463) percent averaging about 10%. Shrub live oak (*Quercus turbinella*) is the dominant shrub, other shrubs that are locally abundant include Mexican cliffrose (*Purshia stansburiana*) and prickly pear (*Opuntia spp.*).

Grass cover averages can be highly variable, ranging from 5% (TEUI 490) in higher elevations to 46% (TEUI 463) cover. Occurring in majority of the TEUIs, sideoats grama (*Bouteloua curtipendula*) is the dominant grass. Other key grasses include tobosa grass (*Pleuraphis mutica*), blue grama (*B. gracilis*) and New Mexico feathergrass (*Hesperostipa neomexicana*).

Existing conditions show a 36% departure from desired conditions. This departure is mostly because of a high percentage of grass/forb areas and a lack of uneven-aged, open-canopy seral states.

Great Basin Grassland

25,493 acres

TEUI 045, 408, 409, 410, 412, 415, 417, 43

Great Basin grasslands comprise 6% of the Chino Landscape analysis area. Majority of this unit is found on the East Zone, east of Hwy 89. Majority of these grasslands are on the periphery of the Big Chino Valley that is within the Forest boundary. The vast majority is an open canopy system, but for a small isolated closed patch west of Yolo Ranch.

The Great Basin Grassland PNVT consists of a grass and forb dominated understory with less than 12% woody cover. It generally occurs on climatically cooler and moister sites among flats, basins, gentle sloping foothills, and transitional valleys and is usually associated with deep and productive soils. The soils are derived from limestone, basalt, dolomite, and alluvium, between 4,260 and 6,200 feet in elevation on mostly slight to moderate (0-22%) slopes.

TEUI predicts low woody cover. Tree cover, dominated by juniper species (*Juniperus spp.*), ranges from 0% (TEUI 045, 415, and 409) to 6% (TEUI 412). Shrub cover can range between 2 (TEUI 412) and 10 (TEUI 433) percent averaging about 2%. Broom snakeweed (*Gutierrezia sarothrae*) and prickly pear (*Opuntia spp.*) are the dominant shrubs, others that are locally abundant include Shrub live oak (*Quercus turbinella*), New Mexico olive (*Forestiera pubescens*) and winterfat (*Krascheninnikovia lanata*).

Grass cover averages can range from 37% (TEUI 409) to 50% (TEUI 415) cover and a species richness of up to 11 grass species present (TEUI 433). Grama grasses, sideoats grama (*Bouteloua curtipendula*), blue grama (*B. gracilis*) and black grama (*B. eriopoda*), occur in majority of the TEUIs and are often the dominant grass. Other key grasses include New Mexico feathergrass (*Hesperostipa neomexicana*), needle and thread (*H. comata*), muhly (*Muhlenbergia spp.*), sand dropseed (*Sporobolus cryptandrus*), curly-mesquite (*Hilaria belangeri*), western wheatgrass (*Pascopyrum smithii*) and threeawn (*Aristida spp*.).

Existing conditions show a 26% departure from desired conditions. This departure is mostly driven by an infill of woody species.

Ponderosa Pine-Evergreen Oak

21,252 acres

TEUI 505, 530, 542, 544, 546, 547, 553, 563

Ponderosa Pine-Evergreen Oak comprise 5% of the Chino Landscape analysis area. Majority of this unit is found around the Campwood area. This vegetation type is well represented by

evergreen oaks which comprise a midstory. This horizontal heterogeneity has resulted in a greater fire severity than in other ponderosa pine forest types.

The Ponderosa Pine-Evergreen Oak PNVT is dominated by a ponderosa pine (*Pinus ponderosa*) overstory, well represented evergreen oak midstory and an understory of evergreen shrub. It generally occurs shallow to moderately deep soils that are extremely cobbly to bouldery. The soils are derived from basalt, schist and granite, between 5,410 and 7,050 feet in elevation with a diverse slope range (0-60%).

Tree cover, dominated by ponderosa pine (*Pinus ponderosa*), ranges from 35% (TEUI 544) to 52% (TEUI 530). Other trees present include alligator juniper (*Juniperus deppeana*), Utah juniper (*J. osteosperma*), piñon (*Pinus spp*.), Arizona white oak (*Quercus arizonica*), Emory oak (*Q. emoryi*) and Gambel oak (*Q. gambelii*). Shrub cover can range between 8 (TEUI 542) and 29 (TEUI 505) percent averaging about 16%. Shrub live oak (*Q. turbinella*) and manzanita (*Arctostaphylos spp.*) are the dominant shrubs, others that are locally abundant include, buckbrush (*Ceanothus fendleri*), Wright's silktassel (*Garrya wrightii*) and mountain mahogany (*Cercocarpus montanus*).

Grass cover averages can range from 12% (TEUI 505) to 26% (TEUI 542) cover and a species richness of up to 7 grass species present (TEUI 505). Grama grasses, sideoats grama (*Bouteloua curtipendula*) and blue grama (*B. gracilis*), occur in majority of the TEUIs and are often the dominant grass. Other key grasses include muttongrass (*Poa fendleriana*) and squirreltail (*Elymus elymoides*).

Currently, the Ponderosa Pine-Evergreen Oak is highly departed (80%) from desired conditions. This departure is mostly driven by historic fire suppression, resulting in dense even-aged stands. Historically, these systems would have supported primarily open canopy with patch size ranging from $^{1}/_{10}$ to 1 acre, but current conditions show 85% of this forest type is in a closed canopy seral state.

Piñon-Juniper Woodland

17,204 acres

TEUI 418, 419, 420, 421, 422, 426

Piñon-Juniper Woodland make up 4% of the Chino Landscape analysis area. Majority of this unit is found northeast of Juniper Mesa Wilderness and west of Sycamore Canyon Wilderness at elevations ranging from 5,000 to 6,400 feet. This vegetation type is typically composed of even-aged structured patches, ranging from 10-100+ acres, with a moderate to high density tree canopy and a limited understory. Typical disturbance (e.g., fire, insects, diseases, etc.) are high severity and occur infrequently. Fire suppression has not exhibited the far-reaching effects like other vegetation types.

These systems generally occur in shallow to moderately deep soils, derived from limestone, basalt and alluvium, and are extremely cobbly to stoney. Sites lie between 5,000 and 6,400 feet in elevation and an average slope of 18%, though slope can range from 0-120%

Tree cover ranges from 30% (TEUI 421) to 42% (TEUI 420) and is dominated by junipers, Utah (*Juniperus osteosperma*) and one seed (*J. monosperma*), and piñon, (piñon pine (*Pinus edulis*) and singleleaf (*P. monophylla*). Shrub cover is not as pronounced in these systems, but can range between 4 (TEUI 422) and 18 (TEUI 421) percent. The most dominant shrubs are mountain mahogany (*Cercocarpus montanus*) and pricklypear (*Opuntia spp*.). Others that are locally abundant include, Wright's silktassel (*Garrya wrightii*), Mexican cliffrose (*Purshia stansburiana*) and fernbush (*Chamaebatiaria millefolium*).

Grass cover can range from 12% (TEUI 420) to 24% (TEUI 422) cover and forbs average <1%. Sideoats grama (*Bouteloua curtipendula*) and blue grama (*B. gracilis*) are the dominant grasses. Other key grasses include stipa (*Hesperostipa spp*.), tobosa (*Pleuraphis mutica*) and squirreltail (*Elymus elymoides*).

Currently, the Piñon-Juniper Woodland PNVT shows a low departure (16%) from desired conditions. In order to reach desired conditions, some of the open canopy woodlands need to increase canopy destiny and tree size.

Interior Chaparral

14,580 acres

TEUI 047, 351, 425, 436, 443, 448, 450, 453, 467, 468,469, 475, 483, 545, 551

Three percent of the analysis area is chaparral vegetation. The largest stands occur on most of the slopes in and around Woodchute Wilderness and east of Sycamore Wilderness. Smaller patches can be found on drier sites of the Santa Maria Mountains. All map units are on slopes greater than 17% but can be as high as 120% and are found between 4,260 feet and 7,630 feet. Soils, derived from residuum sandstone, basalt and andesite, are shallow to moderately deep and extremely stony to flaggy,

On average, tree cover is relatively low 1% (TEUI 351), but in some microclimates tree cover can be as high as 32% (TEUI 551). Junipers (*Juniperus spp*.) and piñon (*Pinus spp*.) are the dominant species, but in higher elevations ponderosa pine (*Pinus ponderosa*) and Gambel oak (*Quercus gambelii*) can be found.

Typically, these systems are a uniform dense structure dominated by shrubs with thick, stiff, waxy evergreen leaves. Shrub cover ranges from 30% (TEUI 351) to 70% (TEUI 551) with shrub live oak (*Quercus turbinella*) being the dominant species. Other common shrubs include mountain mahogany (*Cercocarpus montanus*), skunkbush (*Rhus trilobata*), pointleaf manzanita (*Arctostaphylos pungens*), catclaw mimosa (*Mimosa aculeaticarpa*) and Wright's silktassel (*Garrya wrightii*).

Grasses vary from 6% (TEUI 468) to 30% (TEUI 351), but are typically a minor component in this PNVT. Sideoats grama (*Bouteloua curtipendula*) is the dominant grass, other key species found locally abundant include blue grama (*B. gracilis*), black grama (*B. eriopoda*), threeawn (*Aristida spp*.), muttongrass (*Poa fendleriana*) and New Mexico feathergrass (*Hesperostipa neomexicana*).

The Interior Chaparral PNVT currently has a 91% similarity to desired conditions.

Ponderosa Pine-Gambel Oak

13,169 acres

TEUI 055, 500, 501, 502, 540, 550, 560, 570, 581

Ponderosa Pine-Gambel Oak comprise 3% of the Chino Landscape analysis area. Majority of this unit is found in and north of Juniper Mountain Wilderness and is dominated by ponderosa pine (*Pinus ponderosa*) and Gambel oak (*Quercus gambelii*). It generally occurs in soil (derived from basalt, cinders and limestone) that are shallow to moderately deep and cobbly. Sites can be found between 5,400 and 7,540 feet in elevation with a slopes ranging from 0-40%. Reference conditions shows patch size typically ranged from $^{1}/_{10}$ to ½ acres patches.

Tree cover ranges from 12% (TEUI 555) to 58% (TEUI 500) but typically is closed canopy system. Other trees present include alligator juniper (*Juniperus deppeana*), Utah juniper (*J. osteosperma*), piñon (*Pinus spp*.), and Arizona white oak (*Quercus arizonica*). Shrub cover ranges between 1 (TEUI 500) and 56 (TEUI 555) percent and averages about 5%. Gambel oak (*Q. gambelii*) and manzanita (*Arctostaphylos spp.*) are the dominant shrubs, others that are locally abundant include, buckbrush (*Ceanothus fendleri*) and mountain mahogany (*Cercocarpus montanus*).

Graminoid cover can vary from 8% (TEUI 570) to 26% (TEUI 501) cover and have a species richness of up to 8 grass species present (TEUI 505). Dominant graminoids include sedges (*Carex spp*.), squirreltail (*Elymus elymoides*) and blue grama (*Bouteloua gracilis*). Other key grasses include muttongrass (*Poa fendleriana*), Junegrass (*Koeleria macrantha*), lontongue muhly (*Muhlenbergia longiligula*) and smooth brome (*Bromus inermis*).

Currently, the Ponderosa Pine-Evergreen Oak is highly departed (80%) from desired conditions. Historically, these systems were adapted to drought during the growing season and had mechanisms to tolerate frequent, low intensity surface fire; however, fire suppression has resulted in dense even-aged stands of small to medium size trees.

Semi-Desert Grassland

27,449 acres

TEUI 349, 350, 356, 371, 373, 375, 382, 383

The semi-desert grassland type occur north of Clarkdale and comprise 1% of the project. These grasslands typically consists of a grass and forb dominated understory with a variable abundance of shrub and less than 10% tree cover. It generally occurs in soils, derived from limestone, dolomite, and alluvium, that are shallow to deep. Sites are between 3,500 and 4,200 feet in elevation on slopes averaging 29%, but ranging from 0-120%.

TEUI predicts low tree cover, and current conditions show a tree cover average less than 2% (TEUI 350), with the dominant species being juniper (*Juniperus spp*.). Shrub cover ranges

between 14% (TEUI 375) and 24% (TEUI 382) and is dominated by four-wing saltbush (*Atriplex canescens*), velvet mesquite (*Prosopis velutina*), catclaw acacia (*Acacia gregii*) and crucifixion-thorn (*Canotia holacantha*). Broom snakeweed (*Gutierrezia sarothrae*), creosote bush (Larrea tridentate, Mexican cliffrose (*Purshia mexicana*) and yucca (Yucca spp.) can also be locally present.

Grass cover averages can range from 18% (TEUI 350) to 28% (TEUI 375) and have a richness of up to 9 grass species (TEUI 383). Dominant grasses include, sideoats grama (*Bouteloua curtipendula*), black grama (*B. eriopoda*), cane beardgrass (*Bothriochloa barbinodis*), New Mexico feathergrass (*Hesperostipa neomexicana*), tobosa (*Pleuraphis mutica*) and threeawn (*Aristida spp*.). Additionally, forbs account for ~1% of the vegetative cover.

Current conditions show a low departure (32%) from desired conditions. These departures are mostly caused by an infill of shrubby canopy. Though these grasslands have experienced a long history of anthropogenic disturbance, we are seeing a type shift from a grassland type to a shrubland type. Like other grasslands the semi-desert grassland is dependent on natural fire, and in the absence of fire there is an increase in shrub density and trees can encroach into the grassland.

Riparian Gallery Forest

1,426 acres

TEUI 30, 34, 41, 42, 50

There are no projects in the Riparian Gallery Forest PNVT, therefore it was not analyzed. However, riparian systems are of high biological value and the types of riparian forest (as identified by the Forest Service Southwest Region Riparian Mapping Project (RMAP)) that occur within the project boundary include Arizona alder-willow, desert willow, Fremont cottonwood/shrub, herbaceous riparian, sycamore-Freemont cottonwood, Arizona walnut and Ponderosa pine/willow types.

Noxious Weeds and Invasive Plants

Invasive plant species are those that can invade and negatively alter plant communities and ecological integrity. Typically, invasive plant species have the ability to spread rapidly and reproduce in high numbers, which enables them to effectively crowd out native plant populations. Occurrences of nine species have been mapped in the project area (Table 3).

Early recognition of the invasive plant invasion started in 1986 when invasive plant species were discovered along roadways in northern Arizona. Over the past 50 years, a number of invasive plant species have been introduced into northern Arizona. A number of species, such as Dalmatian toadflax (*Linaria dalmatica*), began to expand in their ranges with little, if any, action being undertaken to control their spread. Surveys conducted on the Prescott National Forest in 1997 revealed a number of invasive plant species have established or expanded on the Forest. The Prescott, Kaibab and Coconino National Forests developed an integrated weed management

program to address the growing concern for noxious and invasive plant species and their impacts on ecosystems and native plant communities (USDA Forest Service 2004).

Table 3. List of noxious weeds that are known to occur within the project area.

Species Name (scientific)	Mapped acres	Arizona Wildlands Invasive Plant Working Group Invasiveness Ranking[1]	EIS Objective
Dalmatian toadflax (*Linaria dalmatica*)	679	Medium	contain/control
Tamarisk (*Tamarix chinensis*)	1,187	High	contain/control
Scotch thistle (*Onopordum acanthium*)	< 1	Low	eradicate
Tree of heaven (*Ailanthus altissima*)	1	Medium	contain/control
Russian Olive (*Elaeagnus angustifolia*)	< 1	High	contain/control
Bull thistle (*Cirsium vulgare*)	2	Low	contain/control
Diffuse Knapweed (*Centaurea diffusa*)	65	Medium	contain/control
Spotted Knapweed (*Centaurea stoebe*)	92	Medium	eradicate
Siberian elm (*Ulmus pumila*)	203	Medium	contain/control

Species Descriptions

Dalmatian Toadflax

Dalmatian toadflax (*Linaria dalmatica*) is an introduced ornamental, perennial invasive plant from the Dalmatian region of Eastern Europe. It can grow up to 3-feet tall, and reproduces from both seed and underground rootstalks. One plant can produce up to one-half million seeds, as well as lateral roots up to 10 feet from the plant (USDA Forest Service 2004). Dalmatian toadflax can crowd out native plants and reduce forage on rangelands. Plants are distributed throughout the project area at eight sites with most mapped acres near Big Bug Creek at the northern portion of the project area. Most mapped acres occur in the Riparian Gallery PNVT along the banks of the Verde River and Hell Canyon.

Tamarisk

Tamarisk (*Tamarix chinensis*) is found at many riparian areas throughout the West. It was introduced as an ornamental tree and for erosion control. Changes in hydrologic and geomorphic

processes (e.g., groundwater pumping) and a variety of land uses such as livestock grazing and agricultural development have largely influenced the establishment of tamarisk at riparian areas (Shafroth et al. 2002). These changes have resulted in a shift from broad-leaved riparian vegetation to more drought-tolerant species, such as tamarisk at many sites. The accumulation of dead and senescent woody material from tamarisk is highly flammable and can increase wildfires in riparian areas (Busch 1995). Tamarisk abundance and dominance is most pronounced where site conditions (flow regimes) are highly departed and less so where site conditions favor native riparian species (Stromberg and Paradzick 2005). Most mapped acres occur in drainages and the Riparian Gallery PNVT along the banks of the Verde River.

Scotch Thistle

Scotch thistle (*Onopordum acanthium*) is a large biennial thistle, native to Europe. Characteristics of this species include broad, spiny stems with vertical ribs, large, spiny leaves with dense hairs and violet to reddish flowers. The plants can create an impenetrable thicket. Seeds are viable for 6 years (USDA Forest Service 2004). This species grows in disturbed habitats along roadsides and in waste areas. Many individuals are found at disturbed areas along roadsides. Isolated infestation occurs on the roadside of the Walnut Creek Road in Section 22.

Tree of Heaven

Tree of heaven (*Ailanthus altissima*) is a deciduous tree from China that can grow up to 90-feet tall. It can reproduce from seed or from root sprouts that create an extensive root system forming dense colonies that out-compete native trees like box elder (USDA Forest Service 2004). Most mapped acres occur in the Riparian Gallery PNVT along the banks of the Verde River.

Russian Olive

Russian olive (*Elaeagnus angustifolia*) is a hardy, fast-growing, deciduous tree that grows to about 30 feet in height. It is silvery in appearance and highly aromatic; its thorny branches are loosely arranged in a rounded shape (USDA Forest Service 2017). It has been planted extensively in areas throughout northern Arizona and can invade riparian areas where it eventually replaces native tree species (USDA Forest Service 2004). Most mapped acres occur in the Riparian Gallery PNVT along the banks Verde River.

Bull Thistle

Bull thistle (*Cirsium vulgare*) is a stout biennial thistle with purple flowers from Eurasia. It invades disturbed sites including slash piles, old log decks and roadsides. Regeneration is solely from short-lived seed (USDA Forest Service 2004). It is found in old firewood sales in the Ponderosa Pine-Evergreen Oak PNVT around the Camp Wood area.

Diffuse Knapweed

Diffuse knapweed (*Centaurea diffusa*) is an annual or short-lived perennial from the Mediterranean region, growing 1 to 2 feet tall. Knapweeds are members of the sunflower family, with a single strong taproot. It reproduces by seed, and seeds can remain viable to 12 years. Dead

plants bread off at ground level and tumble around, spreading seed in the wind. Plots of knapweed have been shown to have more erosion (sediment in runoff) than comparable plots of bare ground (Duncan 1997). It produces chemical compounds that inhibit other species from growing around it (USDA Forest Service 2004). Most mapped acres occur in the Juniper Grassland PNVT and the Great Basin Grassland PNVT, near Bakers Pass.

Spotted Knapweed

Spotted knapweed (*Centaurea stoebe*) is a biennial or short-lived perennial from central Europe, growing 1 to 3 feet tall; it is also a member of the sunflower family. If allowed to spread, it forms a monoculture and reduces desirable plant populations. This species inhibits other plants from growing near it (USDA Forest Service 2004). Most mapped acres occur in the Riparian Gallery PNVT along the banks of the Verde River in the Great Basin Grassland PNVT along the roadside of FR 9815C.

Siberian Elm

Siberian elm (*Ulmus pumila*) is widely grown in many areas of northern Arizona as a shade tree. However, it is not appropriate in wildland settings where it can out-compete native tree species in riparian zones and other sensitive areas. The trees reproduce through winged seeds that can be transported long distances on the wind or by vehicles to new locations. The abundant production of seed will make this species difficult to control (USDA Forest Service 2004). All mapped acres occur in the Riparian Gallery PNVT east of Perkinsville.

Desired Conditions

The desired condition in the Final Environmental Impact Statement (FEIS) for the Integrated Treatment of Noxious and Invasive Weeds (USDA Forest Service 2004) is to prevent any new plants from becoming established on National Forest System lands. The FEIS lists the following objectives for invasive plant species on the Coconino, Kaibab, and Prescott National Forests.

Scotch thistle (*Onopordum acanthium*) and spotted knapweed (*Centaurea stoebe*) is managed as an “eradicate” species. Eradication means attempting to totally eliminate a species from the Forest.

Dalmatian toadflax (*Linaria dalmatica*), tree of heaven (*Ailanthus altissima*), tamarisk (*Tamarix chinensis*), Russian olive (*Elaeagnus angustifolia*), bull thistle (*Cirsium vulgare*), diffuse knapweed (*Centaurea diffusa*) and Siberian elm (*Ulmus pumila*) are managed as *contain/control* species. Control means preventing seed production throughout a target patch and reducing the area covered by a species; whereas contain means to prevent the species from expanding beyond the perimeter of existing patches. Over a period of time a species assigned a control objective will experience a decline in overall population size. The *contain/control* strategies are often combined due to different sized populations found in different areas. For some species it may not be possible to limit the spread of the infestation, and it may only be possible to control a portion of the outbreak on high-value sites.

Sensitive Plant Species

Current Conditions

Sensitive plants are defined as "…species identified by a regional forester for which population viability is a concern as evidenced by: (a) significant current or predicted downward trends in population numbers or density or (b) significant current or predicted downward trends in habitat capability that would reduce the existing distribution of species (FSM 2670.5 Definitions)." While the PNF possesses no data on trends, such as population numbers and amount of suitable habitat for these species, ecosystem departures may have negative impacts to sensitive plant species. For example, changes in moisture availability, changes in flow regimes (drying of soils, catastrophic flooding, water withdraws) and invasive plant infestations likely have and continue to contribute to habitat loss and negative impacts to sensitive plant species. Past fire suppression and exclusion have contributed to the highly stressed conditions and overstocked tree densities at the watershed scale, influencing large severe fires that lead to catastrophic flooding at riparian areas. Many sites have high fuel loads from the accumulation of duff (dead needles on forest floor) and coarse woody debris resulting in fires burning at higher severities. These changes have likely negatively impacted sensitive plant species by limiting sunlight (e.g., closed canopies), reducing plant available moisture (e.g., competition from the increase in woody species), lowering site productivity (e.g., loss of soils), and the overall availability of suitable habitat. While some sensitive plant species are naturally found in frequent-fire habitats, the increase in fire severity may be negatively impacting populations and the amount of suitable habitat. The establishment and spread of invasive plant species is a growing concern on the forest as they have the potential to displace native and sensitive plant species habitat.

Seven sensitive plant species, of varying conservative statuses, are known to occur within the project area (Table 3). NatureServe conservation status ranks are based on a scale of 1 to 5, ranging from critically imperiled (G1) to demonstrably secure (G5). Status is assessed and documented at three distinct geographic scales: global (G), national (N), and state/province (S). The conservation status of a species or ecosystem is designated by a number from 1 to 5, preceded by a letter reflecting the appropriate geographic scale of the assessment. The sensitive plants that occur within the project area range from imperiled to vulnerable (Table 4).

Table 4. Southwestern Region sensitive plant species analyzed

Species Name (Scientific)	Number of Known Populations on Forest	Number of Known Populations in Project Area	NatureServe Conservation Status[1]
Broadleaf lupine *(Lupinus latifolius* ssp. *Leucanthus)*	19	6	G2 S2
Eastwood alum root *(Heuchera eastwoodiae)*	33	6	G3 S3
Mearns sage *(Salvia dorrii* spp. *mearnsii)*	36	29	G5 S3
Ripley wild buckwheat *(Eriogonum ripleyi)*	6	5	G2 S2
Flagstaff beardtongue *(Penstemon nudiflorus)*	10	5	G2 S2S3
Arizona phlox *(Phlox amabilis)*	10	5	G2 S2
Hualapai milkwort *(Polygala rusbyi)*	19	14	G3 S3

[1] NatureServe conservation rankings apply to both state (S) and global (G) status: G1/S1 = critically imperiled; G2/S2 = imperiled; G3/S3 = vulnerable; G4/S4 = apparently secure; and G5/S5 = secure.

Species Descriptions

Broadleaf Lupine

Broadleaf lupine (*Lupinus latifolius* ssp. *leucanthus*) is an herbaceous perennial known from central-northern Arizona and from a few sites in southern Utah. There are 19 known populations of broadleaf lupine on the Prescott National Forest, one of which occurs within the project area. Information on population sizes (number of individuals) are unknown, but the species has been described as locally common at sites (Arizona Game and Fish Department 2005; Southwest Environmental Information Network 2017). On the Forest and in the project area, plants are found along streams, creeks, near springs, and often at north-facing slopes within ponderosa pine forest, chaparral, mixed conifer forest, and riparian woodlands. Typical substrates include granite, granite cobble and basalt.

Eastwood Alum Root

Eastwood alum root (*Heuchera eastwoodiae*) is a herbaceous perennial endemic to central Arizona. There are 33 known populations on the Forest and 7 of these are located in the project area. Information on population sizes (number of individuals) is unknown, but estimates range from occasional to locally abundant where found on the Forest (Southwest Environmental Information Network 2017). On the Forest and in the project area, plants are found along north,

southwest and east-facing slopes, and along ridges in mixed-conifer forests and aspen forests. Typical substrates include basalt, granite, and granite schist.

Mearns Sage

Mearns Sage (*Salvia dorrii*) is a woody perennial endemic to Central Arizona. Individuals tend to occur on easterly aspects with substrates including sandstone, limestone, tan soil, Verde Formation and calcareous ridge tops. The largest known potential threats come from ground disturbing activity, plants appear to not grow back in areas where surface disturbance has occurred (Arizona Game and Fish Department 2002). Population trends are not known, but scattered colonies tend to occur in localized habitats (Arizona Game and Fish Department 2002 and Baker 2014). There are 33 known populations on the Forest and 29 of these are located in the project area. All known project populations occur in the Piñon-Juniper Evergreen Shrub PNVT

Ripley Wild Buckwheat

Ripley wild buckwheat (*Eriogonum ripleyi*) is a distinctive perennial herb or subshrub endemic to Maricopa, Mohave and Yavapai counties, Arizona. Individuals tend to occur on south-facing slopes, where it appears to be restricted to white, calcareous substrates (Arizona Game and Fish Department 2008 and Baker 2014). There are six known populations on the Forest and five of these are located in the project area. All project populations occur abundantly on disturbed soils of the abandoned US Mine. According to Baker (2014) there are no known threats and few potential threats to the PNF populations. Potential threats include OHV disturbance and un-historic fire behavior due to non-native weed fuel loads (e.g. *Bromus spp*.).

Flagstaff Beardtongue

Flagstaff beardtongue (*Penstemon nudiflorus*) is a perennial herb/forb that is found in the mountainous regions south of the Grand Canyon (Arizona Game and Fish Department 2003). Individuals occur on the north and south-facing slopes along dry streams and in dry ponderosa pine forests (Baker 2014). There are 10 known populations on the Forest and five of these are located in the project area. The five population occur in two clusters, one west of the YOLO Ranch and one on Woodchute Mountain. Though the species has a limited distributions, it is common within its range on the PNF, so no serious threats are apparent (Baker 2014).

Arizona Phlox

Arizona phlox (*Phlox amabilis*) is a low perennial herb that usually grows to about 10cm (4 in) tall and produces pink, tubular flowers. This species in endemic to Coconino, Maricopa, Mohave and Yavapai counties, Arizona. Populations tend to occur on north, west and east-facing slopes in open sites of coniferous forest and woodlands, between 3,500-8,000 feet (Baker 2014 and Southwest Environmental Information Network 2017). There are 10 known population on the Forest and five of these are located in the project area. Majority of mapped populations occur in the Ponderosa Pine-Evergreen Oak PNVT, around the Campwood area.

Hualapai Milkwort

Hualapai milkwort (*Polygala rusbyi*) is a perennial subshrub with distinctive pilose leaves and large purple flowers. This species is endemic to Arizona and often occurs on ridge tops and open mesa, with a limestone substrate (Baker 2014). There are 19 known population on the Forest and 14 occur within the project area. All but one of the mapped populations occur at eh base of Big Black Mesa in the Great Basin Grassland PNVT.

Environmental Consequences

Proposed Action

Common to all vegetation types

There are several road actions that are proposed in the project area. These actions include mitigation, close and restrict to authorized users (RAU), close and RAU portion of road, decommission and decommission portion of road. Roads are known to disrupt ecological flow, create edge, reduce patch size and be corridors for invasive plants. An estimated 15-20% of the United States is estimated to be affected by roads (Forman and Alexander 1998). Roads that are closed and mitigated would still remain a feature on the landscape, but the amount of traffic would decrease. This could possibly reduce the risk of invasive weed dispersal. Roads that are decommissioned would, over time, become revegetated. This would result in lower patch fragmentation and reduced edge effect.

Piñon-Juniper Evergreen Shrub

The canopy density at which understory vegetation is adversely affected varies between map units, many lose herbaceous at greater than 30% canopy. To maintain or open canopy cover with fire, treatment should be applied as the opportunity occurs. Mechanical reduction of canopy is identified for areas where canopy limits understory (grasses and shrubs) vegetation. Reducing the canopy cover will also decrease the potential of high severity crown fires. Though high severity fires do occur in these systems, fires are typically mixed severity.

Treatments that reduce tree canopy cover would increase shrub and herbaceous ground cover on most of the map units. For example, TEUI map unit 462 has little herbaceous at potential and succession is between chaparral shrub species and piñon-juniper so reduction of tree canopy in these units would result in an increased shrub cover.

Mechanical reduction of tree canopy and use of wildland fire would reduce the tree canopy, increase shrub and herbaceous composition with primary benefits accruing to watershed condition and wildlife forage.

Severe droughts have been shown to greatly impact piñon pine population. During the drought that occurred in the mid-1990s, some northern Arizona piñon populations experienced a 40% mortality (Ogle et al. 2000). With climatic models predicting more severe droughts, piñon pines, when possible, should be avoided during mechanical treatments to help increase resiliency of the piñon population.

Juniper Grassland

The infill of juniper (post mid-1800s) has notably increased tree cover and densities in some areas. This in turn has decreased the habitat quality for some grasslands species (e.g., pronghorn antelope (*Antilocapra americana*)).

To reduce tree density, the greatest potential to use fire and mechanical thinning in the juniper grasslands have been identified as Tier 1. These areas, and existing natural openings, could be maintained and expanded with these treatments. Decreasing tree density should enhance the grass/forb and shrub components. For example, past treatments in TEUI 490 resulted in a quick response by blue grama to overstory reduction. Reduction of tree density has also been shown to increase abundances of ground-nesting bird species (Rosenstock and Van Riper III 2001).

Implementers should take into account patch size. For mechanical treatments not all junipers need to be targeted. Large individual trees and patches of $^{1}/_{10}^{th}$ to ½ acre should be dispersed throughout the landscape. These components add vertical heterogeneity, edge and cover to the landscape.

Great Basin Grassland

The Colorado Plateau-Great Basin Grassland exhibits low departure from desired conditions in structure and composition; however, without periodic disturbance (such as fire), conditions are expected to trend away from desired conditions. In open areas, prescribed fires could be used to maintain open structure and enhance forage value to wildlife. Densities of woody species have increases in some sites, therefore mechanical treatments and prescribed burns should be utilized to decrease woody species, open up the canopy and enhance the grass/forb component.

Ponderosa Pine-Evergreen Oak

The Ponderosa Pine-Evergreen Oak was historically an open canopy forest with all age classes present, but because of an array of factors has now become a homogenous dense stand of young pine. Not only has this led to high departures from desired conditions, but also increased the chances of bug kill and catastrophic wildfire, and a decrease in animal and structural diversity.

Mechanical thinning and prescribed burns will decrease basal area and open up the canopy. This will reduce the risk of a catastrophic wildfire and open up areas for the establishment of new pine and oak trees. Though not immediate, post-treatment areas will eventually exhibit multi-layered vertical structure, diversity of age classes and lead to more resilient forests (Bradford and Bell 2017). Mechanical thinning followed by prescribed burns has also been shown to increase vegetation richness in pine forests (Strahan et al. 2015).

Thinning projects should focus on opening up the canopy, while also leaving snags and small clumps with interlocking crowns.

Piñon Juniper Woodland

Seventy-four percent of this PNVT has been identified for potential treatment (Tier 1: 17%; Tier 2: 57%) with the use of prescribed fire, mechanical treatment and hand-thinning. If fire conditions are right, these woodlands would be expected to burn at high severity resulting in a stand replacement and successional shift to an early seral state of recently burned, grass, forb and shrub type. The greatest potential to use fire are in patches of woodland that occur within a larger matrix of another PNVT, therefore these patches may be incorporated into a burn block that is targeting another PNVT.

Romme et al. (2007) recognize an increase of tree density in many persistent woodlands, therefore mechanical and hand-thinning projects would be implemented to decrease tree density and enhance large trees by freeing up nutrients. However, removal of trees in persistent woodlands would simply be another human impact in one of our least anthropogenic modified systems; therefore, a more passive management approach should be taken into consideration. If thinning does occur, projects should focus on areas that are productive in producing large to very large trees.

Interior Chaparral

Chaparral systems are highly stable and many of the shrub species are adapted to recover and recolonize quickly (Bock and Bock 1988 and Huebner and Vankat 2003). Use of prescribed fire in the chaparral would have the effect of reducing the biomass of the treated stand and possibly killing trees growing within the stand. The spatial distribution of the chaparral would not change but there would be a short term change in composition favoring faster sprouting species such as catclaw, mountain mahogany and shrub live oak; shrubs typically recover 5-10 years post-fire (Bock and Bock 1988 and Huebner et al. 1999). Forage value to wildlife may also increase with the greater palatability of new growth (Bock and Bock 1988).

Mechanical treatments (e.g., mastication) would remove the shrubby canopy, therefore reducing the fuel load and briefly enhancing the grass and forb component. However, because the Interior Chaparral PNVT is similar to desired conditions, mechanical treatments should only focus on WUI (wild-urban interface) areas as a fuel break.

Ponderosa Pine-Gambel Oak

The Ponderosa Pine-Gambel Oak was historically an open canopy forest with all age classes present, but because of an array of factors has now become a homogenous dense stand of young pine. Not only has this led to high departures from desired conditions, but also increased the chances of bug kill and catastrophic wildfire, and a decrease in animal and structural diversity.

Mechanical thinning and prescribed burns will decrease basal area and open up the canopy. This will reduce the risk of a catastrophic wildfire and open up areas for the establishment of new pine and oak trees. Though not immediate, post-treatment areas will eventually exhibit multi-layered vertical structure, diversity of age classes and lead to more resilient forests (Bradford and Bell 2017). Mechanical thinning followed by prescribed burns has also been shown to increase vegetation richness in pine forests (Strahan et al. 2015). Gambel oak is a fire adapted species, so after fire it will resprout aggressively.

Thinning projects should focus on opening up the canopy, while also leaving snags and small clumps with interlocking crowns.

Semi-Desert Grassland

No active treatments are proposed in the Riparian Gallery Forest PNVT, therefore it was not analyzed.

Riparian Gallery

No active treatments are proposed in the Riparian Gallery Forest PNVT; however, some prescribed burns may "back down" into the riparian corridor from upland sites. In general, fires in southwest riparian systems tend to burn less frequently and less severely than adjacent upland sites because they differ in structure, geomorphology, hydrology, microclimate and fuel characteristics (Dwire and Kauffman 2003) and historically were not a primary disturbance factor (U.S. Fish and Wildlife Service 2002). Effects from prescribed burns may include postfire erosion from adjacent upland sites and limited loss/damage to riparian obligate vegetation. Riparian systems have high ecological resiliency, but season of fire may be critical in the survivorship of riparian obligate trees (Dwire and Kauffman 2003). Loss of native trees would result in the loss of shade for the stream/soil, change in soil chemistry, change in fungal community and possible increase/establishment of nonnative vegetation (Busch 1995, Smith and Finch 2016). Therefore, to mitigate these negative effects, riparian areas should be avoided when riparian vegetation show signs of stress (e.g. drought).

Sensitive Plant Species

Broadleaf Lupine

Under the proposed action, broadleaf lupine (*Lupinus latifolius* ssp. *leucanthus*) is within proposed mechanical thinning treatment and prescribed fire areas in the Ponderosa Pine Forest PNVT. Mechanical ground disturbance is unlikely to directly impact broadleaf lupine as these activities are not proposed in streams and riparian areas where most plants are found.

While there are no mapped occurrences of invasive plant species near broadleaf lupine occurrences, mechanical ground disturbance may result in the establishment and spread of invasive plant species into suitable habitat of broadleaf lupine. Invasive plant species (specifically those with deep spreading root systems) have the potential to crowd out broadleaf lupine and reduce suitable habitat. Negative impacts from invasive plant species are expected to be minimized from the implementation of resource protection measures that include identification of invasive plant species prior to project implementation, treatment, and revegetation.

Streamside management zones are expected to provide protection from most direct effects to occurrences in riparian areas. However, riparian areas are often used as firebreaks and buffers do not necessarily eliminate the possibility of prescribed fires backing into riparian areas. Due to its perennial underground stems, this plant is expected to grow back after some disturbance from fire (Baker 2014). The top foliage of plants may be impacted, but during low- to moderate-intensity prescribed burns, but may survive and resprout from below ground stems. In situations where fires back into riparian areas and are allowed to burn, negative impacts to broadleaf lupine are probably minimal because they are managed to not burn at high severities.

The proposed action is not expected to have significant negative impacts to broadleaf lupine populations within the project area because plants occur in locations (mesic conditions along streams and riparian areas) generally isolated from direct and indirect effects. Additionally, the species has some adaptations to fire that provide additional protection (ability to re-establish from

below ground stems). The proposed action of reducing fuel loads and catastrophic fires in the watershed is expected to reduce the risk of flooding and scouring at riparian areas that could eliminate individuals or populations. Therefore, effects of the proposed action are expected to provide overall beneficial effects to broadleaf lupine populations by improving habitat conditions over the long term. Viability concerns are low because potential negative effects are not of sufficient intensity to pose substantial risk and these effects are limited to 32 percent of known populations on the Prescott National Forest. For these reasons, the proposed action may affect individuals of the species, but is not likely to result in a trend toward Federal listing or loss of viability.

Eastwood Alum Root

Under the proposed action, one occurrence of Eastwood alum root (*Heuchera eastwoodiae*) is located in proposed, conventional ground-based mechanical thinning and all occurrences are located in proposed prescribed fire treatment areas. All occurrences are located in the Ponderosa Pine PNVT. Since the species usually occurs in rocky slopes and cliffs, it is not likely to receive direct damage from mechanical equipment or fire line construction. The species could, however, be directly damaged by falling trees or by trees being moved.

All populations in the project area are within areas proposed for prescribed fires. Since effects of prescribed burning cannot be completely controlled, it is possible that some occurrences could receive some damage from fire. The species' response to fire is unknown, but it often occurs in habitats that evolved with fire as a frequent disturbance (ponderosa pine forests). The microhabitat conditions of cool, rocky substrates may not burn intensely—therefore providing some protection from fire. Also, the plant has a somewhat woody rhizome (Elvander 1992) that may survive low- and moderate-intensity fires. Negative effects of fires to individuals are expected to be minimal because fires are prescribed to mimic natural fire regimes of low to moderate intensity fire. Changes in the canopy structure from treatments could alter habitat conditions (less shady conditions), but there is not enough scientific information to understand what impacts this would have on Eastwood alum root.

Competition from invasive plant species may impact populations, but currently there are no mapped occurrences of invasive plant species in the immediate vicinity of Eastwood alum root occurrences. Resource protection measure for invasive plant species, including avoiding infested areas and measures (equipment cleaned before entry) to reduce transport of new weeds, would also reduce the likelihood of new invasive plant populations establishing within Eastwood alum root habitat.

The proposed action of vegetation treatments are expected to provide beneficial effects by reducing stressed conditions, reducing woody species encroachment, and increasing site productivity within Eastwood alum root habitat. Negative impacts are more likely to occur from ground-disturbance activities. Only one population in the project area are within areas of proposed mechanical thinning, but the species habitat (rocky slopes) does provide some protection. Viability concerns are low because these negative effects are not of sufficient intensity to pose substantial risk, effects are limited to a relatively small proportion (18 percent) of all populations on the Forest, and habitat conditions are expected to improve as a result of the

proposed action. For these reasons, the proposed action may affect individuals of the species, but is not likely to result in a trend toward Federal listing or loss of viability.

Mearns Sage

Under the proposed action, all 29 occurrence of Mearns sage (*Salvia dorrii*) are located in Tier 2, which means these are not primary sites for treatment. However, these areas still have the potential for prescribed fires and mechanical and hand thinning. All occurrences are located in the Piñon-Juniper Evergreen Shrub PNVT. Since the species usually occurs in rocky slopes and ridgelines, it is not likely to receive direct damage from mechanical equipment or fire line construction. The biggest threat come from OHV recreation (Baker 2014).

All populations in the project area are within areas proposed for prescribed fires. Since effects of prescribed burning cannot be completely controlled, it is possible that some occurrences could receive some damage from fire. However, no damage from fire has been reported for this species (Baker 2014).

Competition from invasive plant species may impact populations, but currently there are no mapped occurrences of invasive plant species in the immediate vicinity of Mearns sage occurrences. Resource protection measure for invasive plant species, including avoiding infested areas and measures (equipment cleaned before entry) to reduce transport of new weeds, would also reduce the likelihood of new invasive plant populations establishing within Mearns sage habitat.

The proposed action of vegetation treatments are expected to provide beneficial effects by reducing stressed conditions, reducing woody species encroachment, and increasing site productivity within Mearns sage habitat. Negative impacts are more likely to occur from ground-disturbance activities. All population in the project area are within Tier 2 areas, but the species habitat (rocky slopes) does provide some protection. Viability concerns are low because these negative effects are not of sufficient intensity to pose substantial risk, populations are dispersed throughout their habitat, and habitat conditions are expected to improve as a result of the proposed action. For these reasons, the proposed action may affect individuals of the species, but is not likely to result in a trend toward Federal listing or loss of viability.

Ripley Wild Buckwheat

Under the proposed action, all five occurrence of Ripley wild buckwheat (*Eriogonum ripleyi*) are located in Tier 2 areas. All occurrences are located in the Piñon-Juniper Evergreen Shrub PNVT. Since the species usually occurs in disturbed sites, it is not likely to receive direct damage from mechanical equipment or prescribed fire.

Competition from invasive plant species may impact populations, but currently there are no mapped occurrences of invasive plant species in the immediate vicinity of Ripley wild buckwheat occurrences. Resource protection measure for invasive plant species, including avoiding infested areas and measures (equipment cleaned before entry) to reduce transport of new weeds, would also reduce the likelihood of new invasive plant populations establishing within Eastwood alum root habitat.

Viability concerns are low because there are no known threats and few potential threats for this species (Baker 2014). For these reasons, the proposed action may affect individuals of the species, but is not likely to result in a trend toward Federal listing or loss of viability.

Flagstaff Beardtongue

Under the proposed action, three occurrence of Flagstaff beardtongue (*Penstemon nudiflorus*) are located in Tier 1 areas with proposed conventional ground-based mechanical thinning (slopes less than 40 percent) and all occurrences are located in proposed prescribed fire treatment areas. This species usually occurs along dry streams and dry forests.

All populations in the project area are within areas proposed for prescribed fires. Since effects of prescribed burning cannot be completely controlled, it is possible that some occurrences could receive some damage from fire. The species' response to fire is unknown, but it often occurs in habitats that evolved with fire as a frequent disturbance (ponderosa pine forests). Negative effects of fires to individuals are expected to be minimal because fires are prescribed to mimic natural fire regimes of low to moderate intensity fire. Changes in the canopy structure from treatments could alter habitat conditions (less shady conditions), but there is not enough scientific information to understand what impacts this would have on Eastwood alum root.

Competition from invasive plant species may impact populations, but currently there are no mapped occurrences of invasive plant species in the immediate vicinity of Flagstaff beardtongue occurrences. Resource protection measure for invasive plant species, including avoiding infested areas and measures (equipment cleaned before entry) to reduce transport of new weeds, would also reduce the likelihood of new invasive plant populations establishing within Flagstaff beardtongue habitat.

The proposed action of vegetation treatments are expected to provide beneficial effects by reducing stressed conditions, reducing woody species encroachment, and increasing site productivity within Flagstaff beardtongue habitat. Though the species has a limited range, it is common within its range and there appears to be no serious threats to its viability (Baker 2014). Viability concerns are low because these negative effects are not of sufficient intensity to pose substantial risk, effects are limited to half of all populations on the Forest, and habitat conditions are expected to improve as a result of the proposed action. For these reasons, the proposed action may affect individuals of the species, but is not likely to result in a trend toward Federal listing or loss of viability.

Arizona Phlox

Under the proposed action, three occurrences of Arizona phlox (*Phlox amabilis*) are located in Tier 1 areas, and all occurrences are located in proposed prescribed fire treatment areas. Majority of mapped populations occur in the Ponderosa Pine-Evergreen Oak PNVT. There are some potential threats from mechanical equipment or fire line construction. The species could, however, be directly damaged by falling trees or by trees being moved.

All populations in the project area are within areas proposed for prescribed fires. Since effects of prescribed burning cannot be completely controlled, it is possible that some occurrences could

receive some damage from fire. The species' response to fire is unknown, but it often occurs in habitats that evolved with fire as a frequent disturbance (ponderosa pine forests). Negative effects of fires to individuals are expected to be minimal because fires are prescribed to mimic natural fire regimes of low to moderate intensity fire. Changes in the canopy structure from treatments could alter habitat conditions (less shady conditions), but there is not enough scientific information to understand what impacts this would have on Arizona phlox.

Competition from invasive plant species may impact populations, but currently there are no mapped occurrences of invasive plant species in the immediate vicinity of Arizona phlox occurrences. Resource protection measure for invasive plant species, including avoiding infested areas and measures (equipment cleaned before entry) to reduce transport of new weeds, would also reduce the likelihood of new invasive plant populations establishing within Arizona phlox habitat.

The proposed action of vegetation treatments are expected to provide beneficial effects by reducing stressed conditions, reducing woody species encroachment, and increasing site productivity within Arizona phlox habitat. Negative impacts are more likely to occur from ground-disturbance activities. Viability concerns are low because these negative effects are not of sufficient intensity to pose substantial risk, effects are limited to half of all populations on the Forest, and habitat conditions are expected to improve as a result of the proposed action. For these reasons, the proposed action may affect individuals of the species, but is not likely to result in a trend toward Federal listing or loss of viability.

Hualapai Milkwort

Under the proposed action, 14 occurrence of Hualapai milkwort (*Polygala rusbyi*) are located in Tier 2 areas that would mostly focus on prescribed fire treatments. All but one of the occurrences are located in the Great Basin Grassland PNVT. All populations in the project area are within areas proposed for prescribed fires. Since effects of prescribed burning cannot be completely controlled, it is possible that some occurrences could receive some damage from fire. However, fire probably poses little danger to individuals because their rhizomes probably survive natural fire. Negative effects of fires to individuals are expected to be minimal because fires are prescribed to mimic natural fire regimes of low to moderate intensity fire. The biggest threat would come from firelines and off-road vehicle traffic.

Competition from invasive plant species may impact populations, but currently there are no mapped occurrences of invasive plant species in the immediate vicinity of Hualapai milkwort occurrences. Resource protection measure for invasive plant species, including avoiding infested areas and measures (equipment cleaned before entry) to reduce transport of new weeds, would also reduce the likelihood of new invasive plant populations establishing within Hualapai milkwort habitat.

The proposed action of vegetation treatments are expected to provide beneficial effects by reducing stressed conditions, reducing woody species encroachment, and increasing site productivity within Hualapai milkwort habitat. Negative impacts are more likely to occur from ground-disturbance activities. Though 74% of the Forest population occurs in the project area,

viability concerns are low because these negative effects are not of sufficient intensity to pose substantial risk, and habitat conditions are expected to improve as a result of the proposed action. For these reasons, the proposed action may affect individuals of the species, but is not likely to result in a trend toward Federal listing or loss of viability.

Invasive Plant Species

The vegetation treatments in the proposed action have the potential to increase the establishment and spread of invasive plant species and impact ecosystems and native plant communities.

Mechanical Thinning Operations

Notable soil disturbance would occur through skid trail development, and temporary road and landing construction. Yarding with tractors may produce soil disturbance as well. In areas of extensive ground disturbance, the potential for introducing new invasive plant species or for spread of existing invasive plant species would increase. Thinning operations would decrease forest density that may open the canopy enough in places to give invasive plant species an advantage—specifically at areas with naturally dense forest canopies. Fires may be prescribed in these areas following mechanical treatment. Combined treatments of mechanical thinning and burning rather than just burning alone have been shown to increase invasive plant species richness and cover (Metlen and Fiedler 2006).

Tamarisk, tree of heaven, Russian olive, and Siberian elm are unlikely to experience an increase in abundance and extent from mechanical thinning, because they occur in riparian areas where most thinning activities and potential follow-up treatments (e.g., prescribed fire) are not concentrated.

Dalmatian toadflax populations are within areas proposed for mechanized thinning. Equipment used in thinning operations has the potential to increase the spread of existing plants by moving seed and root fragments of Dalmatian toadflax (Arizona Wildlands Invasive Plant Working Group 2005). These areas may also receive follow-up prescribed burning treatments. Most studies on the species indicate that prescribed fires do not result in a reduction of individuals or populations; plants are either unaffected or increase as a result (see the “Prescribed Burning” section). Combined treatments (mechanical thinning and prescribed fire) have a greater potential to increase existing infestations because ground disturbance creates opportunities for new plants to establish and fires would either maintain or increase infestations. Specific resource protection measures, such as the removal of invasive plant species prior to project implementation, would be particularly important in reducing the spread and increase of existing infestations.

Few acres of scotch and bull thistle have been mapped in the project area. Information on negative impacts of Scotch thistle on ecosystems is limited. There is some evidence that highly disturbed habitats with high soil moisture favor the establishment and spread of Scotch thistle (Beck 1999). Follow-up treatments of prescribed fire may also increase infestations.

Existing infestations of Scotch thistle and Dalmatian toadflax in these areas are more susceptible to increasing in extent and abundance because combined treatments (mechanized and prescribed

fire) have greater effects to these species than just one type of treatment alone (e.g., hand thinning, prescribed fire, etc.). Specific resource protection measures of removing invasive plant species before project initiation, avoiding high risk areas, and implementing contract measures that require equipment cleaning would be particularly important in reducing negative effects.

Prescribed Burning

Low- to moderate-intensity burns are likely to be followed by rapid recovery of native species and invasive plant species are less likely to invade (Brooks 2008). However, in areas where existing invasive plant species are well established they may persist following fires of varying intensities. Areas with hot burns or pile burns are more likely to experience establishment or spread of invasive plant species (Korb et al. 2004); however, prescribed fires would be managed in a way that allows fire to play out its natural role and behavior within a predetermined area, therefore, reducing potential infestations of new invasive plant species in the project area.

Some of the preparation activities connected with burning may disturb the ground surface and create conditions suitable for new invasive plant species to establish. Hand felling and leaving felled trees in place would be a minor disturbance, but constructing firelines would remove ground vegetation and expose bare soils. According to resource protection measures, hand-constructed firelines would be rehabilitated after burning operations are completed.

Tree of heaven, Russian olive, Siberian elm and Tamarisk are located in riparian areas outside of the proposed activities and therefore unlikely to experience an increase in abundance or extent. In the event that fires do back into riparian areas they are anticipated to cause very minimal damage to vegetation.

There is a potential that existing infestations of Dalmatian toadflax could increase from prescribed fires. Root buds of Dalamatian toadflax can survive fires and the removal of above ground stems can stimulate regrowth and vegetative shoots (Lajeunesse 1999). Dalmatian toadflax shows a positive response to pre-monsoon prescribed burning, but not post-monsoon burning (Phillips and Crisp 2001). The timing of prescribed burning may be an important factor in Dalmatian toadflax post-fire response. Other factors, such as site conditions and adaptations of plant community to fire, also affect how Dalmatian toadflax responds to fire. Most studies indicate that toadflax is likely to increase or remain stable from fire (Arizona Wildlands Invasive Plant Working Group 2005). Effects are anticipated to be minimized; largely from the proposed resource protection measures, minimal ground disturbance, and the relatively small proportion of existing infestation acres (less than .01 percent) within the proposed prescribed burning areas in the project area. Specific resource protection measures of removing invasive plant species before project initiation or avoiding high risk areas and the timing of burns (e.g., pre-monsoon burns versus post-monsoon burns) would be particularly important in reducing negative effects. Other invasive plant species, such as mullein (*Verbascum thapsus*) and cheatgrass (*Bromus tectorum*), are assumed to be in project area and on the Forest, but have not been mapped. Where these species are abundant, prescribed burning can result in the increase in infestations and result in reduced plant diversity and increase fire intensity.

Overall, the potential for expansion of existing and new invasive plant infestations from prescribed fire activities is expected to be lower than combined mechanical thinning and prescribed fire activities (see “Mechanical Thinning Operations” section).

Mechanized Fuel Treatments (Mastication)

This type of treatment would result in only small areas of bare ground and would be less likely to promote new invasive plant infestations than treatments that leave large bare areas on the landscape. Any areas that remain bare would provide openings for invasive plant establishment and spread.

There are no existing invasive plant occurrences in areas proposed for mastication (mechanized fuel treatments) and proposed resource protection measures are designed to reduce new invasive plant species from establishing (treat and identify invasive plant species prior to project implementation). Prescribed burns would be used to maintain vegetation changes following mastication. See the “Prescribed Burning” section for potential effects to new and existing invasive plant infestations from prescribed burning.

Hand Thinning

Since no ground-disturbing machinery would be used, these treatments would result in minimal ground disturbance. Prescribed burning would be used to maintain vegetation changes. See the “Prescribed Burning” section for potential effects to new and existing invasive plant infestations from prescribed burning.

There are no existing invasive plant occurrences within areas proposed for non-mechanized fuel treatments and the likelihood of new invasive plant species establishing is low due to the limited amount of ground-disturbance activities and resource protection measures designed to reduce invasive plant infestations.

Alternative A

All the vegetation (i.e. PNVT, noxious and invasive plants and sensitive plants) treatment effects will remain the same. The only difference is roads that have a proposed action will continue to remain open. Therefore, these roads will continue to attribute to edge effect, fragmentation between patches, corridors for noxious weeds and access to some areas where sensitive plants occur.

Cumulative Effects

Cumulative effects to vegetation include past and ongoing management actions by the Forest Service such as forest thinning; prescribed fire treatments; range management; recreational activities (motorized and non-motorized); and construction, reconstruction, and decommissioning of roads and trails. Most of the negative effects of these actions are either avoided through the design of the project or mitigated to comply with the Forest Plan and other regulations.

For sensitive plant species, the cumulative effects area is the Forest boundary because effects to populations in the project area can influence the viability of the species (e.g., the loss of a disjunct population can lower the genetic diversity of the species), particularly for rare and sensitive plant species with narrow distributions and small populations sizes. This area is also chosen because it reflects our authority and ability manage for sensitive plant species and their viability on National Forest System lands. The boundary does not extend outside the Forest to include the entire species range. The assumption is made that occurrences on state and Federal land outside the Prescott National Forest are mitigated for according to the appropriate law, regulation, and policy, and the Forest Service does not have the authority to manage populations on private land.

Depending on the habitat of the plant species and life history, the temporal boundary for this analysis is difficult to summarize for most sensitive and rare plant species because their ability to recover from disturbance is highly variable and simply unknown in many cases. The spatial component is important in the analysis of cumulative effects because it captures the intensity and distribution of activities and potential effects (habitat fragmentation, potential loss of populations/extirpation, etc.) to sensitive plant species.

Timber and Fuel Reduction Projects

Past and current fire suppression (and exclusion) has resulted in large-scale and long-term changes to vegetation structure and composition. As a result, tree densities have increased to uncharacteristically high levels, increasing the risk of catastrophic wildfires. Atypical fire regimes (generally longer fire-return intervals and more severe fires) may result in the loss of suitable habitat for rare and sensitive plant species.

While historic trends and distribution of invasive or sensitive plant species on the Prescott National Forest is unavailable, it is reasonable to assume that past actions may have resulted in impaired habitat conditions, a reduction in suitable habitat for sensitive species, and the establishment and spread of invasive plant species.

Since 2005, there has been 66,576 acres of prescribed fires and 9,736 acres of mechanized fuel reduction (through mastication) on the Forest. These past treatments and resulting effects to the PNVTs are captured in existing conditions. The Kaibab National Forest is also working on a large grassland restoration project which may coincide with some of the Prescott's grassland work. This will help to create contiguous grassland corridors.

Environmental assessments were prepared for these projects, which include design features that mitigate negative effects to sensitive plant species found within its project area.

Although the effects of vegetation treatments are mitigated to reduce the effects, these projects still result in modification of the habitat/vegetation. However, over time these treatments will promote conditions that support ecological integrity (productive soils, high structural diversity in vegetation, etc.).

Grazing

Grazing does occur throughout the Forest over 76,186 acres and would continue to in the foreseeable future. Historical overgrazing in the West has altered native plant communities and influenced the establishment and spread of invasive plant species (DiTomaso 2000). Livestock grazing, if improperly managed, can contribute to a decrease of herbaceous cover and desired perennial grasses and forbs. It can also result in the crushing of individual plants and reduction of suitable habitat. However there is no evidence that current grazing practices have adversely affected sensitive plant species or that managing viable sensitive plant populations are in direct conflict with grazing potential on the Prescott National Forest.

Mining

Large flagstone quarries are located on the northern boundary of the east zone and mining is expected to continue. Large-scale excavation or rock removal could negatively affect Eastwood alum root, and Metcalfe's tick-trefoil, or their habitat. New roads may be constructed for mineral access and vehicles can act as a vector in transporting new invasive plant populations onto the Forest. Mining permits are approved by the Bureau of Land Management, but for sites on National Forest System lands, the Forest Service may add protection measures for resources.

Recreation

Recreation activities can be vectors for the spread of invasive plant species (e.g., through the transport of plant material via off-highway vehicles) and can result in direct damage by crushing individual plants. Currently, there is no management for hiking and horseback riding off of established trails, nor is there site-specific data for where this many be occurring in relations to sensitive plant populations.

Road Maintenance and Land Use Projects

Maintenance of Forest Service roads, along with the management of easements for state highways by Arizona Department of Transportation, is heavily mitigated to decrease effects to resources and the spread of invasive plant species. Most of these effects do not directly impact sensitive plant species as they do not occur along roadsides where most infestations are located. Projects that are authorized on National Forest System lands are also mitigated to decrease or avoid such effects.

Cumulative Effects Determination

Past actions have impacted vegetation structure and composition. There is no evidence that any current and foreseeable actions are anticipated to cause substantial negative impacts to the vegetation. This project would help to create more resilient ecosystems.

The proposed action has the potential to have direct effects to sensitive plant species, but most are beneficial. Short-term negative effects, such as soil compaction and damage, are a possibility, but proposed resource protection measures will greatly aid in reducing such effects. In general, the proposed combined fuel treatments will benefit sensitive plant species by reducing stressed habitat conditions, woody species encroachment (potential competition), and increasing site productivity over time.

The proposed action also has the potential to increase the abundance of existing and new invasive plant species in the project area. Specifically, Scotch thistle and Dalmatian toadflax have a much higher invasion potential than other invasive plant species in the project area because of their response to management, post-disturbance response, and the presence of occurrences within the proposed treatment areas (mechanized treatments and prescribed burning). Invasive plant establishment or spread would be most likely on the areas proposed for landing, temporary road, or fireline construction.

While there is a potential for direct negative effects, the proposed action will increase ecosystem resiliency, reduce stressed conditions and dense overgrown vegetation, and promote native plant diversity which will aid in buffering the negative effects of invasive plant species (well established native plant communities at less risk of invasive species establishing). The proposed action would also reduce canopy cover in the project area, thus reducing the potential for a stand-replacing wildfire that could create large openings for the establishment of invasive plant species.

Project resource protection measures and continuation of the Prescott National Forest invasive plant management program would help to reduce the potential for invasive plant species to be introduced or spread as a result of proposed actions. Equipment cleaning provisions would be incorporated into the final project contract as a measure to prevent introduction of new invasive plant species or spread of existing invasive plant species. Temporary roads, landings, and firelines would be seeded where needed with a Forest-approved seed mix to prevent the establishment of invasive plant species.

Since invasive plant treatment is not proposed in either alternative, invasive plant monitoring, and treatment where needed, after project implementation would be important to prevent increasing the abundance, distribution, and richness of invasive plant species in the project area. Any treatment would fall under the Record of Decision for Integrated Treatment of Noxious or Invasive Weeds on the Coconino, Kaibab, and Prescott National Forests within Coconino, Gila, Mohave, and Yavapai Counties, Arizona (2004).

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Appendix A

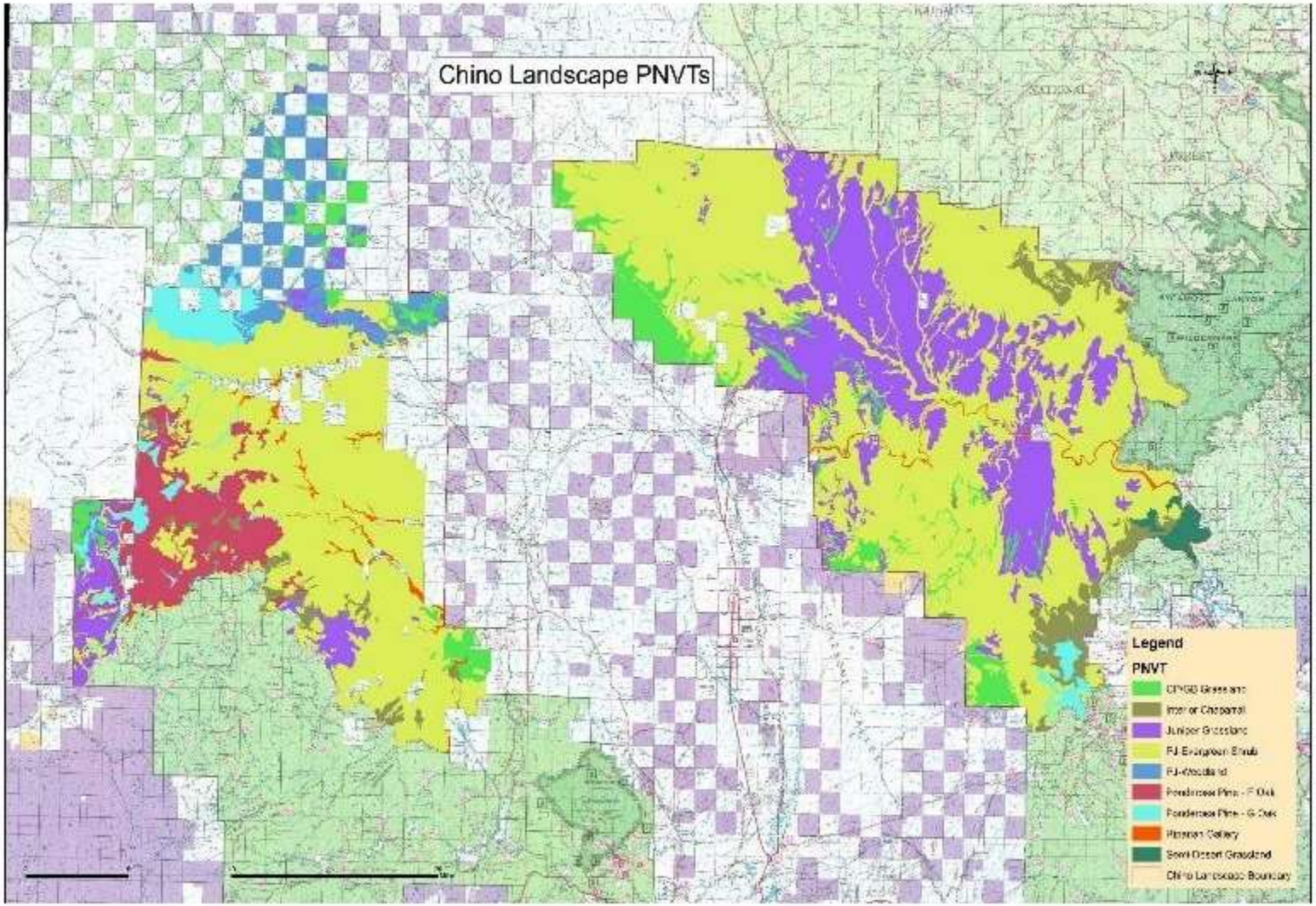

Figure 1. Map of Chino Landscape PNVTs

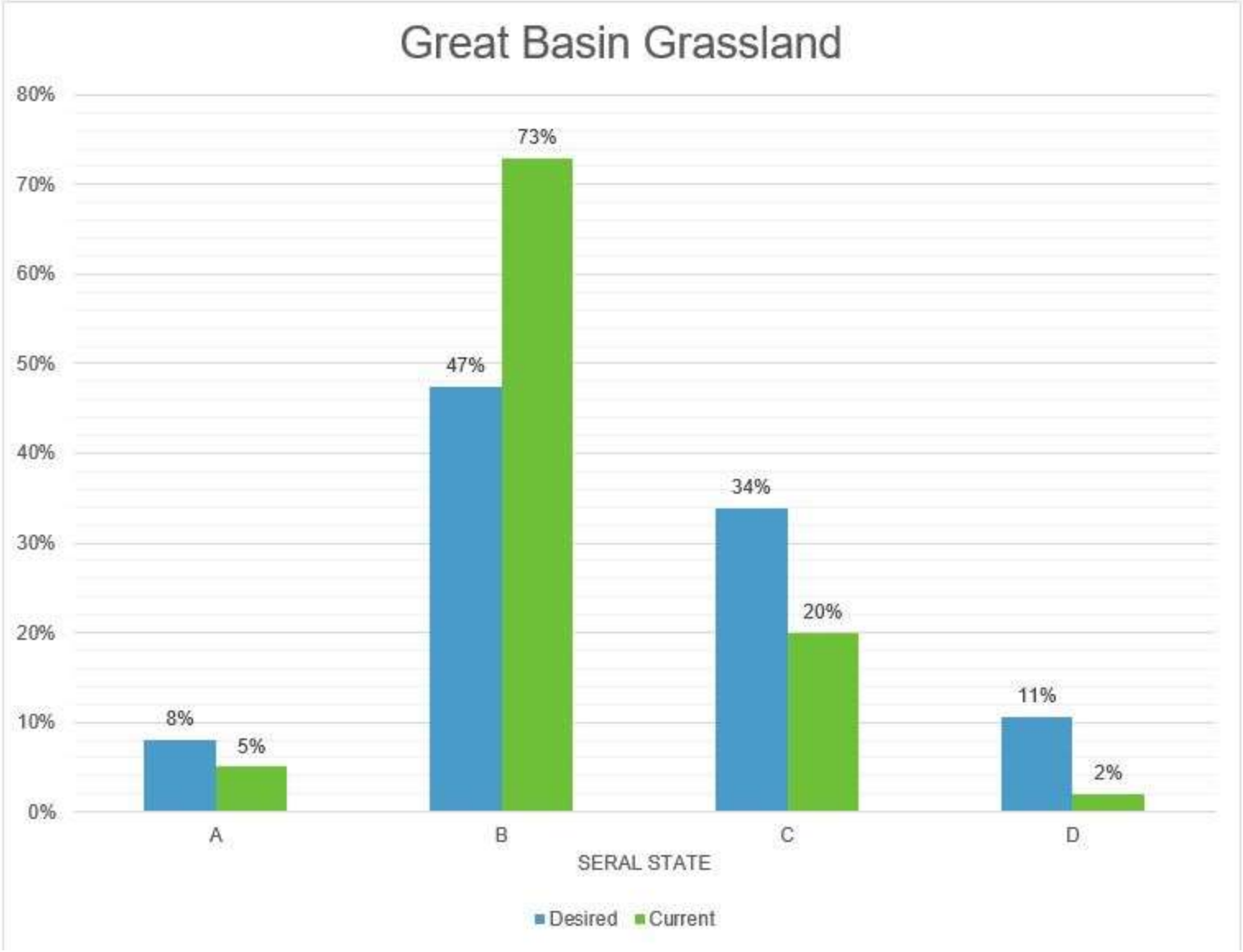

Figure 2. Desired versus current seral state conditions for the Great Basin Grassland PNVT

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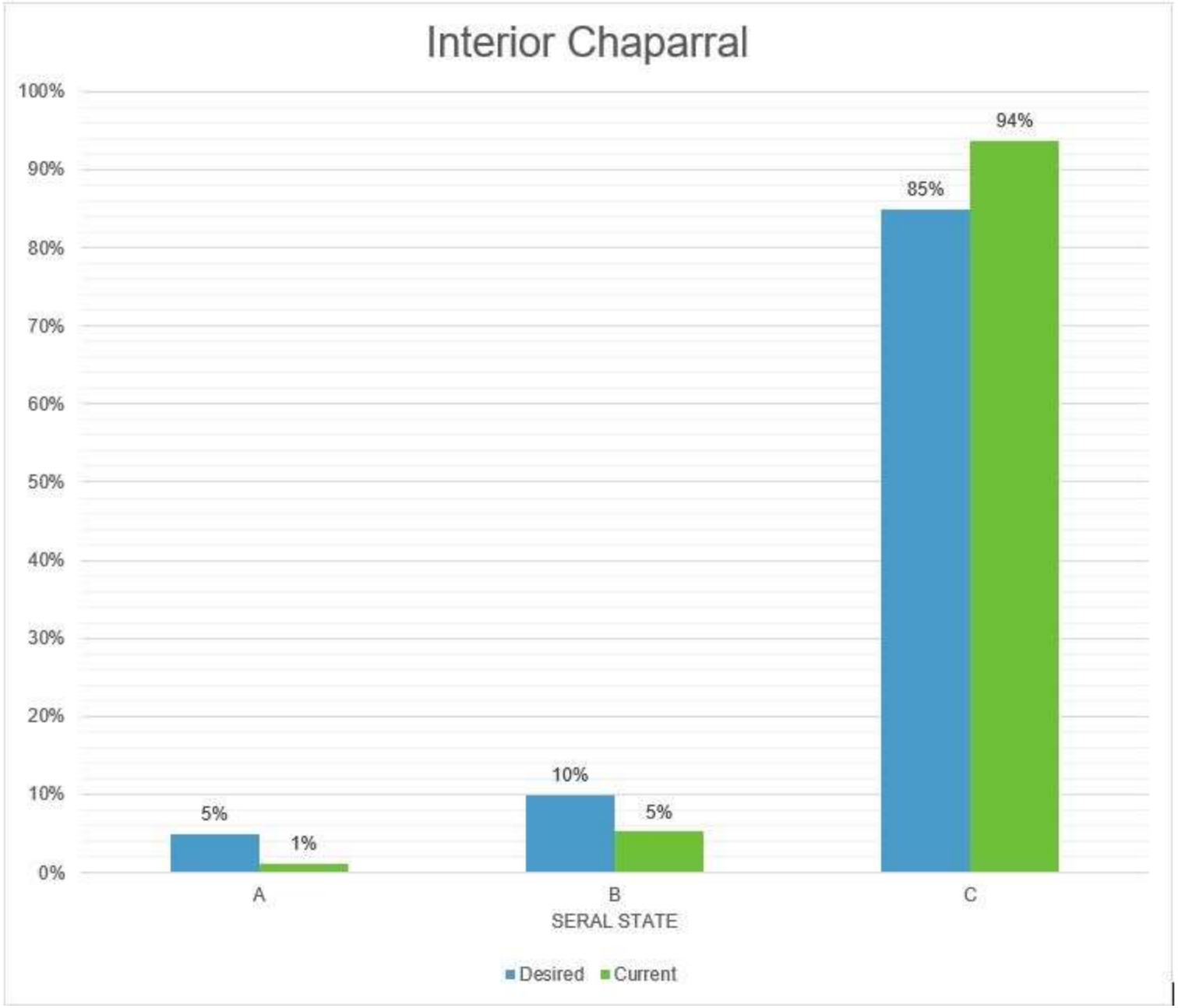

Figure 3. Desired versus current seral state conditions for the Interior Chaparral PNVT

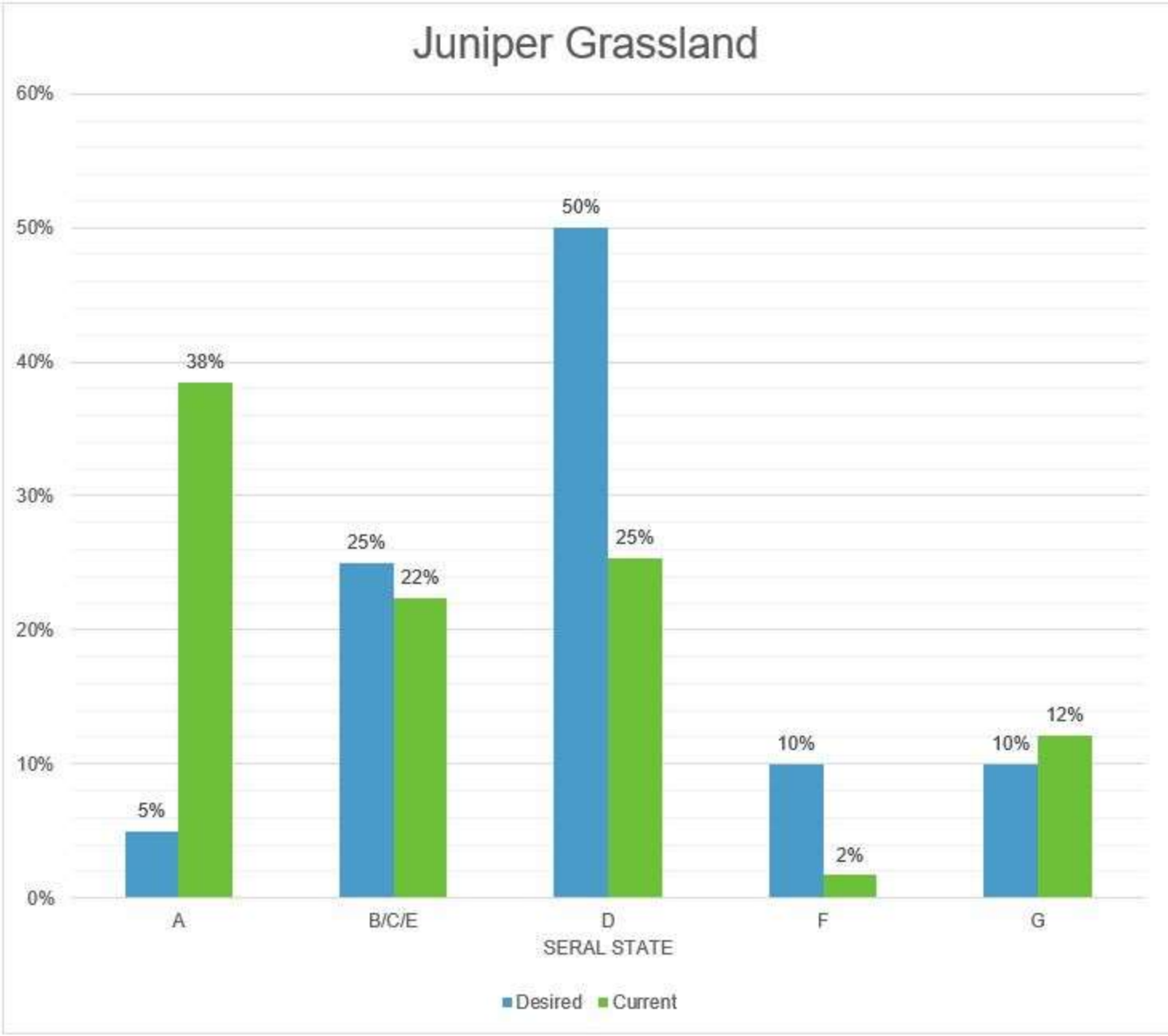

Figure 4. Desired versus current seral state conditions for the Juniper Grassland PNVT

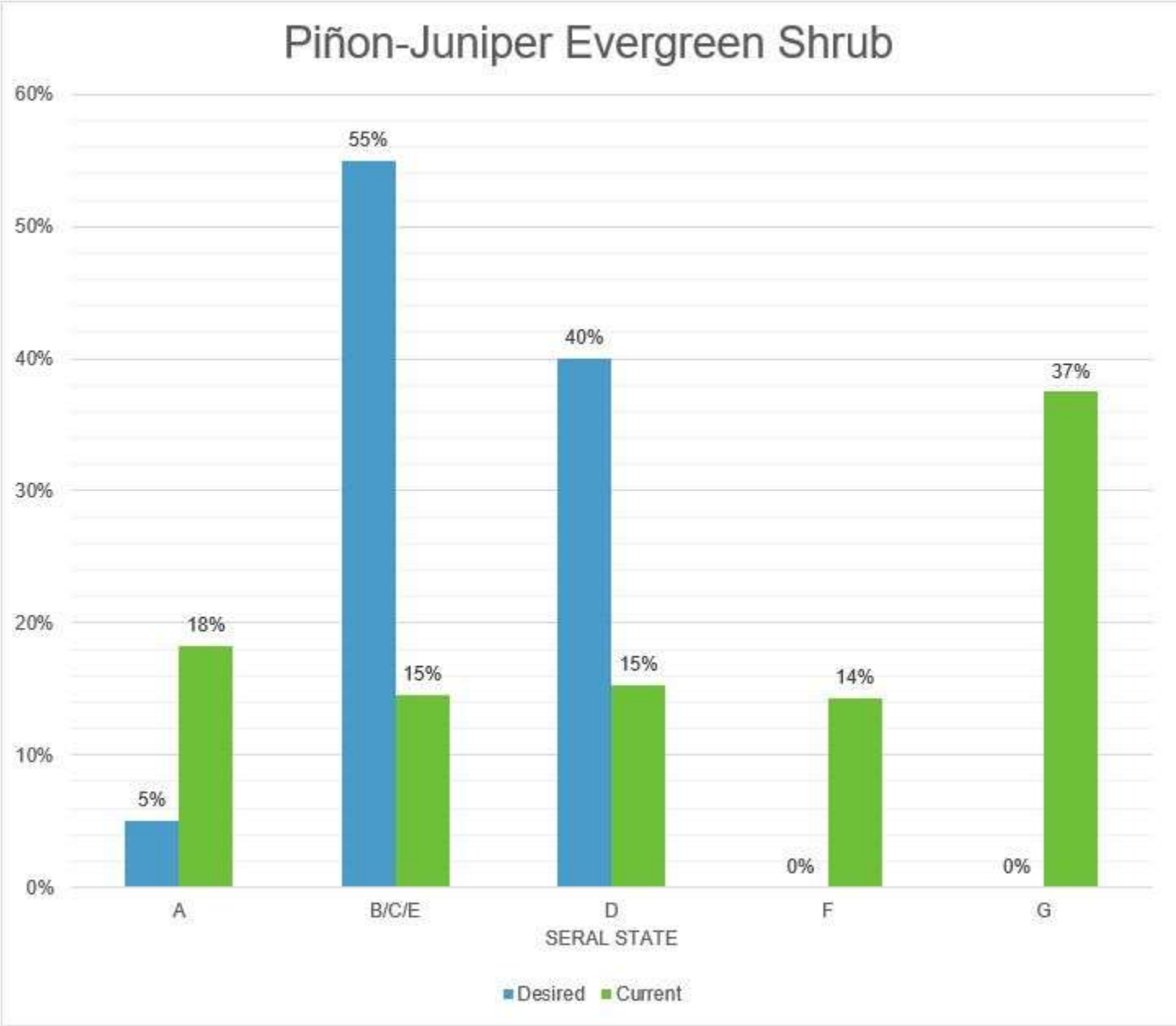

Figure 5. Desired versus current seral state conditions for the Piñon-Juniper Evergreen Shrub PNVT

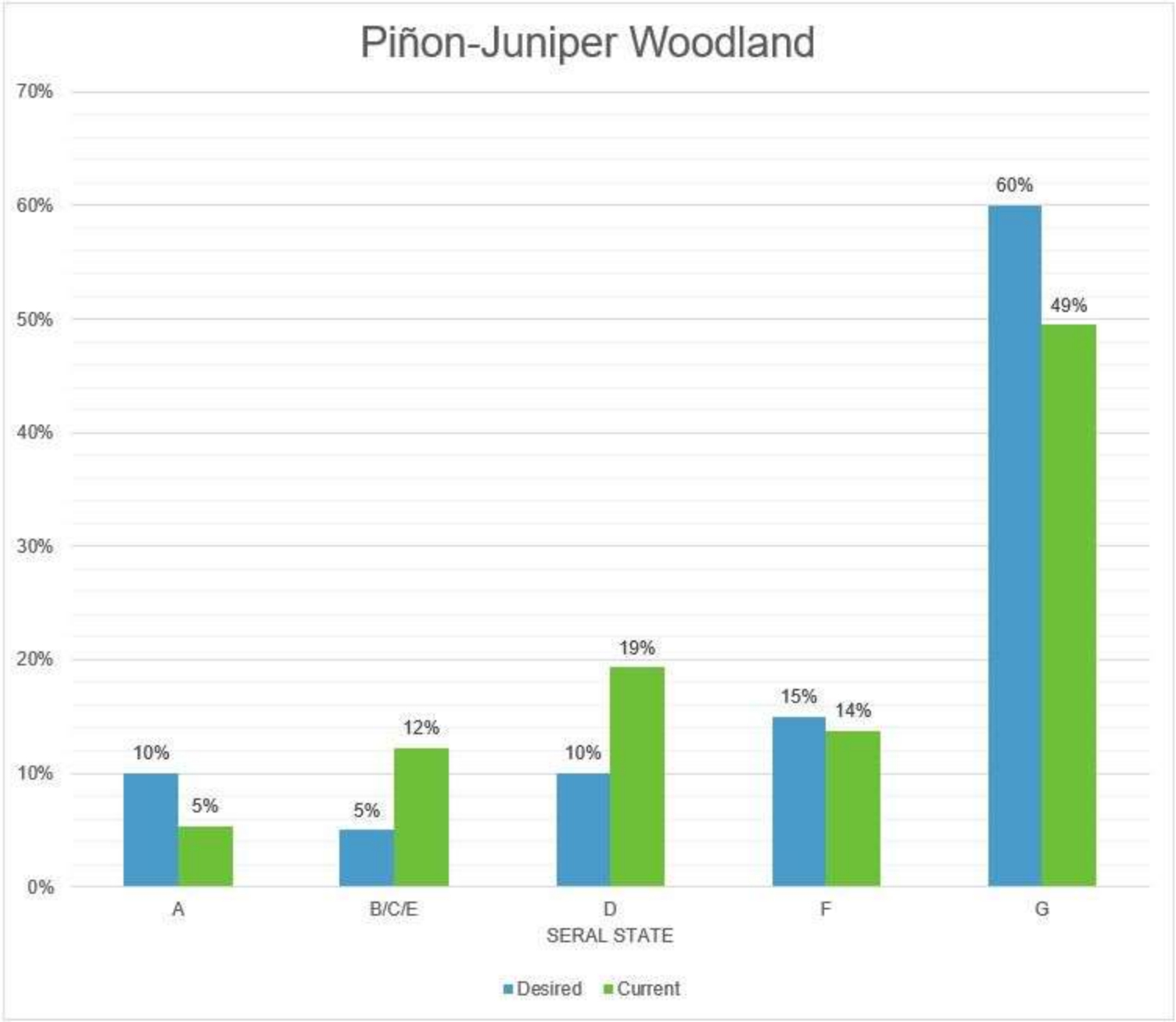

Figure 6. Desired versus current seral state conditions for the Piñon-Juniper Woodland PNVT

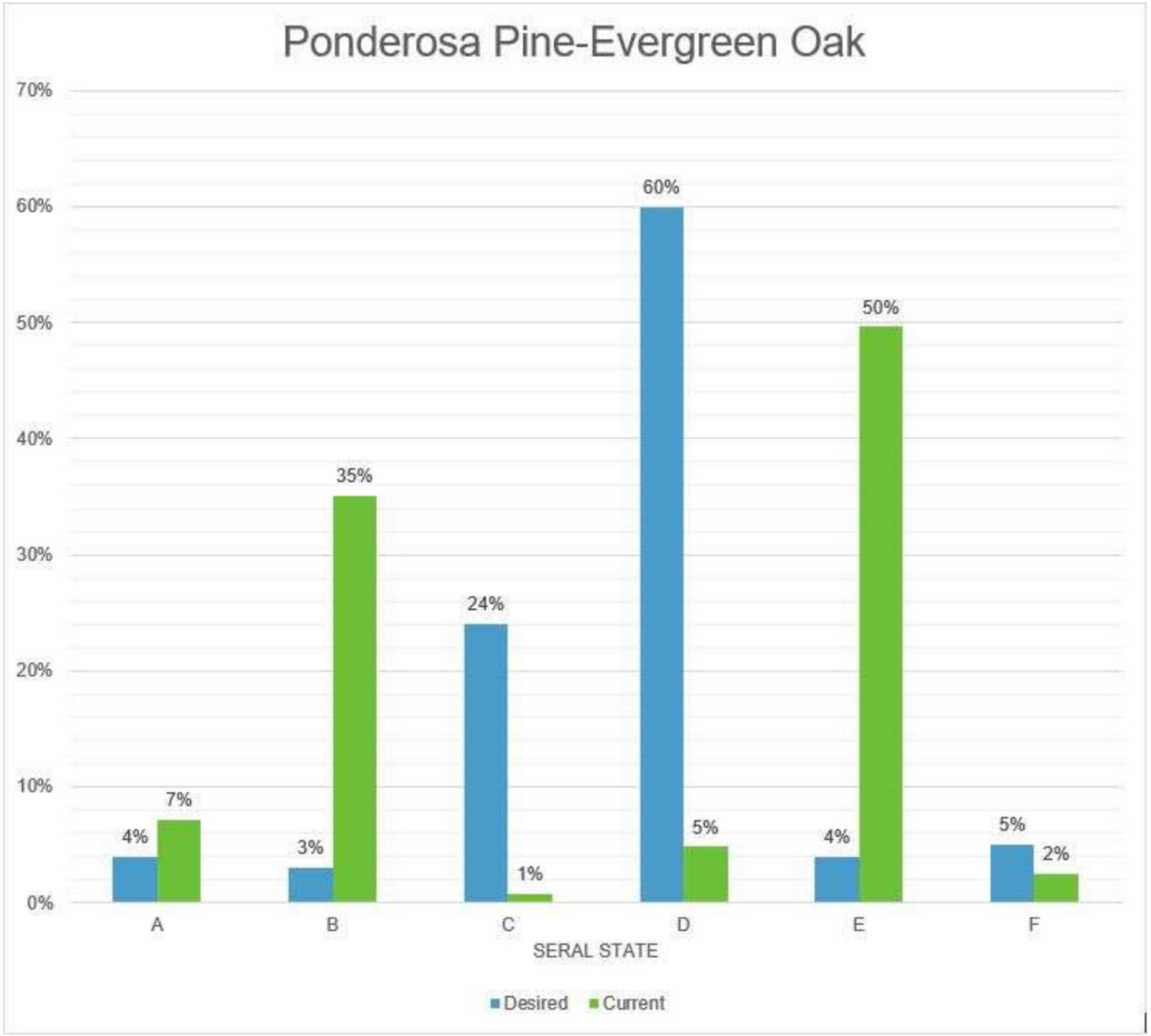

Figure 7. Desired versus current seral state conditions for the Ponderosa Pine-Evergreen Oak PNVT

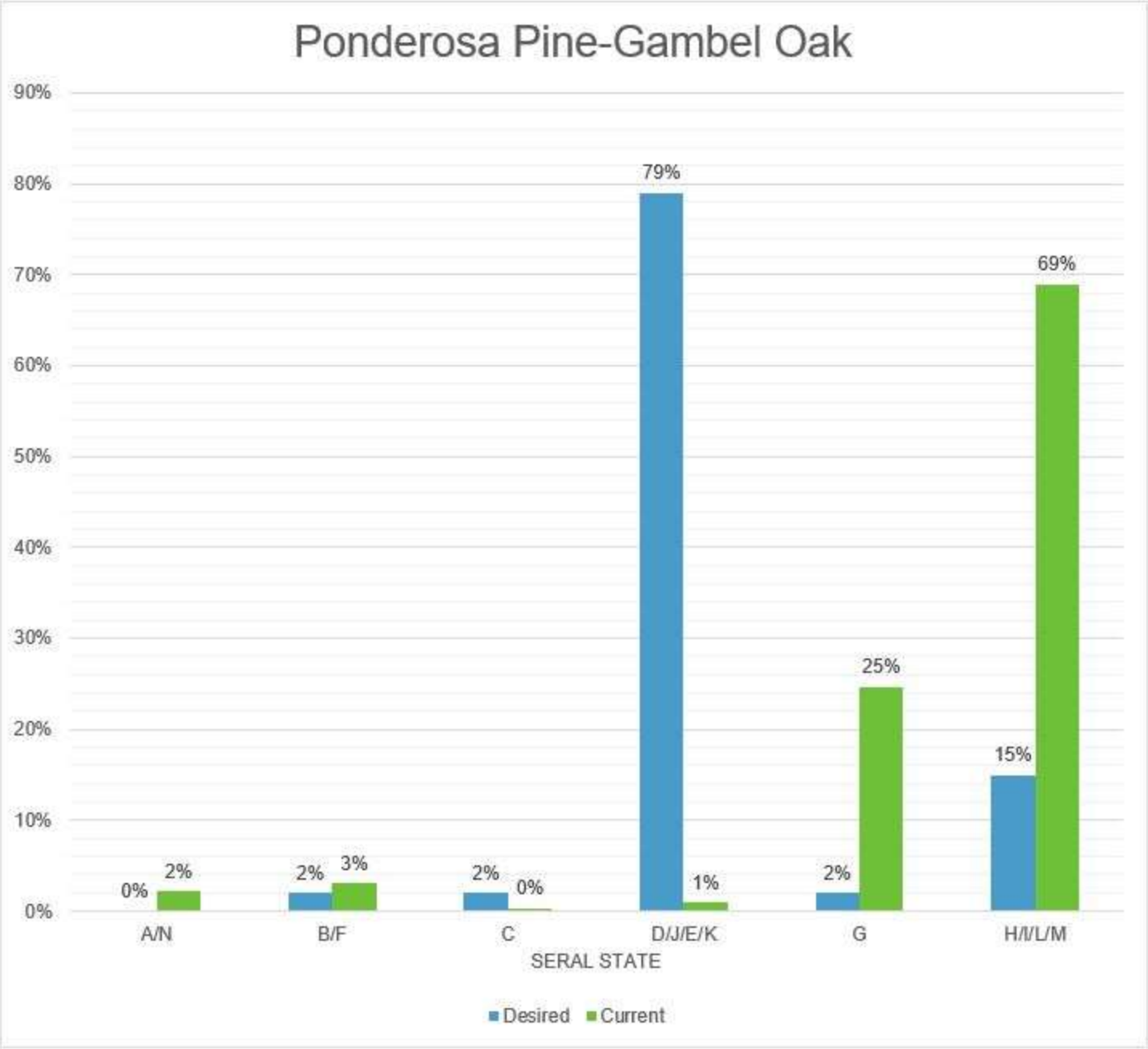

Figure 8. Desired versus current seral state conditions for the Ponderosa Pine-Gambel Oak PNVT